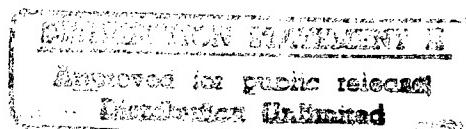


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UDC 358.4:355.237.124:613.6

**Correction of the Body's Functional State in
Aviation School Flight Instructors During Heavy
Flight Schedules**

18400345 Moscow VOYENNO-MEDITSINSKIY
ZHURNAL in Russian No 10, Oct 88 pp 54-56

[Article by Professors V.I. Kopanev, major general of the medical service, and V.A. Yegorov, colonel of the medical service]

[Abstract] Flight instructors often work long hours under stressful conditions: between 66 and 85 percent of their total annual flight time comes between April and August. Data from observations of 81 flight instructors indicate that the fatigue that sets in near the end of such a heavy

flight schedule effects the functional state of the body and efficiency, as evidenced by, for example, flying errors, higher stress levels, and lower attention span. The researchers examined four measures for improving the functional state and efficiency: mandatory rest periods during heavy flying schedules, self-massage of acupuncture points, special physical exercises, and central electroanalgesia. Self-massage of acupuncture points had a positive effect on parameters such as work and visual efficiency, time measurement, tremometry, and stress. Exercise also affected efficiency and stress, plus the cardiovascular system and neurological status. Electroanalgesia was found to improve, among other things, attention span, memory, and thinking. Depending on the type of fatigue, one or all of the three methods could be prescribed. Results confirmed, however, that they cannot replace a carefully managed regime of work, rest, and diet. References: 6 (Russian).

UDC 633.11+581.15

Effects of Gamma-Irradiation of Winter Wheat Interspecies Hybrids on Morphogenesis

18400324b Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA in Russian No 5, Sep-Oct 88 pp 79-84

[Article by A. M. Kokhmetova, T. T. Mynbayev, and S. S. Ilyichev, Institute of Botany, KaSSR Academy of Sciences]

[Abstract] Gamma-irradiation studies were conducted with the seeds and pollen of a hard winter wheat hybrid obtained by crossing Dneprovskaya-521 with G-216 in order to secure varieties suitable for further breeding and wheat improvement. Evaluation of the effects of irradiation on morphogenesis showed that the approach was useful in enriching the genotype as a result of mutagenesis, with irradiation of the pollen (1 kR) shown to yield the most promising results. Irradiation markedly enhanced the spectrum of variability, facilitating thereby the selection of plants with large spikes, short stems, and high grain yields for breeding. The maximum rate of induced morphologic changes with pollen irradiation was 7.9%, some two percentage points higher than the frequency obtained with seed irradiation. References 8: 5 Russian, 3 Western.

UDC 58:09:581.151.575.2

Callus Formation and Plant Regeneration Processes in Cultivated Winter Wheat Embryos Treated with Nitrosomethyl Urea

18400351 Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR. SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 12, Dec 88 (manuscript received 8 Jul 88) pp 51-53

[Article by V. P. Bannikova, V. V. Morgun, corresponding member UkSSR Academy of Sciences, P. D. Maystrov, Ye. A. Barabanova and V. F. Logvinenko, Institute of Botany, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] The effects of N-nitromethylurea (NNMU) on callus formation and plant regeneration were studied by exposure of immature seed buds of Kharkov-II and Lutescens-7 winter wheat varieties to the mutagen. The results showed that exposure of 14-day-old seed buds to 0.005 percent NNMU did not affect the frequency of callus formation. However, the frequency of embryonic callus tissue formation was diminished by exposure to NNMU in both varieties of winter wheat. Once formed, such tissue were capable of plant regeneration. Thus, pretreatment of the seed buds with NNMU was felt to have no direct effect on regenerative capacity, but only on the formation of embryonic tissues capable of regeneration. The Kharkov-11 variety, which is less prone than the Lutescens-7 variety to callus formation, was affected in a more negative manner by NNMU than the Lutescens-7 variety. References 7: 4 Russian, 3 Western.

UDC 575.126:612.111:638.178.8

Effects of Anthrax Toxin on Chemiluminescence of Human Leukocytes

18400316a Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 88 (manuscript received 22 Jul 87) pp 16-20

[Article by E. Ye. Tafelshteyn, S. V. Kalmakov, A. B. Chernov, A. M. Kondratyeva, and V. A. Bashkova, Irkutsk Antiplague Institute of Siberia and the Far East; Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences]

[Abstract] A study was conducted on the effects of crude anthrax toxin consisting of a protective antigen (85 kD), an edema factor (89 kD), and a lethal factor (83 kD) on chemiluminescence of human leukocytes stimulated to phagocytosis by addition of latex particles to the incubate. Incubation of the toxin, derived from *Bacillus anthracis* 34 F₂, at 37°C in Hanks solution with the leukocytes and the latex particles for 60 min showed a linear toxin dose-related inhibition of chemiluminescence. The minimum toxin concentration required for inhibition was on the order of 3-5 µg per 5 x 10⁵ leukocytes. A mixture of the edema factor and the protective antigen was some five-fold more effective in inhibiting chemiluminescence than the crude toxin. Since the edema factors possesses adenylate cyclase activity, determinations of enzymatic activity demonstrated that under the conditions employed, the degree of inhibition of both preparations was directly correlated with adenylate cyclase activity. Thus, leukocyte chemiluminescence may be used as a convenient method for assessing the immunosuppressive potential of anthrax toxin and its components. In addition, the fact that inhibition is dependent on adenylate cyclase may provide further inkling into the mechanisms of phagocytosis. Figures 3; references 14: 2 Russian, 12 Western.

UDC 612.8:577.352

Effects of Spider *Eresus Niger* Venom on Frog Myoneural Synapses

18400316b Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 88 (manuscript received 25 Jun 87) pp 20-23

[Article by P. B. Usmanov, D. Kalikulov, A. B. Nenlin (dec.), K. E. Nasyrov, K. D. Akhmedov, and B. A. Tashmukhamedov, Institute of Physiology, Uzbek SSR Academy of Sciences]

[Abstract] To expand the availability of neurotoxic preparations derived from spiders, screening studies were performed with the venom isolated from the spider *Eresus niger* (fam. Eresidae). The testing was conducted with an *n. ischiadicus-m.sartorius* preparation obtained from the frog *Rana temporaria*. The electrophysiological studies demonstrated that the venom blocked spontaneous as well as induced neuromediator release, as

indicated by depression of miniature end-plate potentials and the induced potentials, respectively. The results were analogous to those obtained with viper venom showing a presynaptic mechanism of action and possessing phospholipase activity. Enzymatic studies on the spider venom also demonstrated the presence of phospholipase activity, providing further indication that the venom is in fact a presynaptic neurotoxin. Figures 1; references 15: 11 Russian, 4 Western.

UDC 577.151

Receptor-Enzyme Systems. Kinetic Regularities of Action

18400336a Moscow BIOKHIMIYA in Russian Vol 53 No 10, Oct 88 (manuscript received 13 Aug 87) pp 1677-1683

[Article by S. D. Varfolomeyev, Moscow State University imeni M. V. Lomonosov]

[Abstract] A study is made of the kinetic behavior of receptor-enzyme systems that determine the mechanisms associated with the transmission and refinement of current information at the level of cellular response. Receptors are analyzed as chemical-signal transducers that perform highly selective binding of an effector to the receptor, allowing "recognition" and primary detection of the chemical signal. Several mechanisms of effective enzymatic amplification of this primary signal are suggested. The final phase of the information transmission and processing activity is desensitization to prevent overloading of the system. Figures 6, references 15: 14 Russian, 1 Western.

UDC 577

Isolation and Properties of Monomer and Oligomer Forms of Gene-Engineered Human Leukocytic Interferon α A from *Pseudomonas* sp.

18400336b Moscow BIOKHIMIYA in Russian Vol 53 No 10, Oct 88 (manuscript received 24 Aug 87) pp 1718-1727

[Article by S. I. Borukhov, L. S. Izotova, L. P. Korobitsin, V. V. Bumyalis, A. P. Pivovarov and A. Ya. Strongin, All-Union Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow]

[Abstract] Human leukocytic α A interferon produced by recombinant bacterial strains detects the presence of large numbers of oligomers—dimers, trimers, tetramers, etc.—in whose formation intermolecular disulfide bonds participate. This article studies methods for effective separation and analysis of the properties of individual monomer and oligomer forms of gene-engineered α A interferon. Multiple-step ion-exchange and high-performance gel chromatography and preparative electrophoresis in PAAG were used to generate detectable quantities of monomer and oligomer protein forms. The

individual forms obtained were analyzed by a method based on the use of monoclonal antibodies of identical specificity. The heterogeneous forms are found to consist of four monomers, four dimers, two trimers and one tetramer. A comparative analysis of the antiviral activity of the individual forms generated indicated that that specific activity of the protein oligomers was identical to that of the monomer. The antiviral status of a cell is apparently determined by the quantity of receptors activated by interaction with the α A-interferon, not by the quantity of interferon or its processing products present in the cell. Figures 5, references 25: 5 Russian, 20 Western.

UDC 615.385.16.074

Biochemical and Immunochemical Studies of Heterogeneity of Polymerized Hemoglobin

18400337d Moscow BYULLEHEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 10, Oct 88 (manuscript received 21 Jul 87) pp 446-448

[Article by Ye. P. Vyazova, M. A. Azhigirova, A. L. Shuvalova, T. G. Groznaya, M. G. Vashkevich, A. M. Zeynalov and N. I. Afonin, Laboratory of Gas-Bearing Blood Correctors, Central Scientific REsearch Institute of Hematology and Blood Transfusion, Moscow]

[Abstract] Gel Filtration, isoelectric focusing, and immunoelectrophoresis were employed in an analysis of the heterogeneity of polymerized hemoglobin prepared by glutaraldehyde-mediated crosslinking of pyridoxal-5'-phosphate-containing hemoglobin. The findings demonstrated that a preparation with about 50 percent polymerization represented a polydispersed polymer with an MW range of 65 to 600 kD. The pI of the preparation was in the 6.6-7.2 range, compared with a range of 6.9-7.2 for native hemoglobin. In addition, a subfraction of the polymerized preparation limited to 500 kD components had pI values in the 6.5-7.0 range. Immunochemical analysis revealed that the polymerized hemoglobin displayed a much wider spectrum of antigenic activity, presumably due to conformational changes in the monomeric components and to the configuration of tertiary and quaternary structures. The conclusion was reached that elimination of the larger MW components would be advisable to reduce the antigenicity of what promises to be a very effective blood substitute. Figures 1; references 9: 3 Russian, 6 Western.

UDC 579.83:577.1

Variable Production of Two Delta-Endotoxins by *Bacillus Thuringiensis* Subspecies

18400349b Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 304 No 5, Feb 88 (manuscript received 14 Jun 88) pp 1253-1255

[Article by L. I. Zhuchilin, V. V. Bessoltsev and Yu. N. Kurashova, Irkutsk State University]

[Abstract] Screening studies were conducted on 89 strains of *B. thuringiensis* to assess the predominant pattern of delta-endotoxin formation. The cells were grown on meat-peptone broth at 28°C, with protein analysis of the parasporal bodies performed by polyacrylamide gel electrophoresis. The results demonstrated that in 75 of the strains a single strongly stained band was obtained representing the 130 kD toxin, along with a very weak 135 kD band. In nine strains the 135 kD component represented the dominant toxin, while the 130 kD toxin was represented by a weakly staining band. Finally, in the case of three strains two equally intense bands were identified, which seemed to represent equivalent synthesis of the 130 and 135 kD toxins. Ouchterlony immunodiffusion revealed two antigenically distinct entities, suggesting that two different genes are responsible for the synthesis of the 130 and 135 kD delta-toxins in the various strains of *B. thuringiensis*. Figures 2; references 12: 6 Russian, 6 Western.

UDC 577.182.99'15:577.352.465

Ionophoric Properties of New Antibiotic Cafamycin and Its Structural Analogue Indanomycin (X14547A)

18400360B Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 5 No 12, Dec 88 (manuscript received 18 May 88) pp 1326-1332

[Article by Yu. N. Antonenko, A. I. Zebrev, N. V. Murenets, and T. V. Smolkina, Moscow State University imeni M. V. Lomonosov, Interdepartmental Problem Scientific Research Laboratory of Molecular Biology and Bioorganic Chemistry imeni A. N. Belozerskiy; All-Union Scientific Research Institute of Antibiotics, Moscow]

[Abstract] A detailed study is presented of the transport of cations through the bilayer lipid membrane as induced by indanomycin and its close structure analogue, a new antibiotic called cafamycin, which was recently synthesized at the All-Union Scientific Research Institute of Antibiotics. The capability of these two ionophores to induce K^+/H^+ -exchange on the membranes of mitochondria is also demonstrated, as is the ability to cause aggregation of thrombocytes. The differences in the structures of cafamycin and indanomycin consist of replacement of the methyl group by an ethyl group in position 2 near the carboxyl group and the presence or absence of an ethyl group in position 16 of the tetrahydroindane of the cyclic system. These structural differences cause three main effects: 1) the K^+/Na^+ selectivity of the ionophores is changed, 2) the effectiveness of cation transfer through the membrane is altered, and 3) the stoichiometry of the cation- ionophore complexes that transport ions through the membrane is altered. Figures 5; References 24: 7 Russian, 17 Western

UDC 577.152

Comparative Estimation of Methods of Immobilization of Chymotrypsin on Solid Carriers to Increase Their Hemocompatibility

18400365D Moscow BIOTEKHNOLOGIYA in Russian Vol 4 No 6, Nov-Dec 88 (manuscript received 11 Aug 86) pp 759-764

[Article by I. P. Andrianova, deceased, M. V. Tsybulskaya, N. P. Mikaelyan, Scientific Research Institute of Physical and Chemical Medicine, Moscow]

[Abstract] One complication of hemosorption is trauma to the formed elements of the blood and a decrease in the level of thrombocytes, giving great practical significance to the search for methods of increasing the hemocompatibility of adsorbents. One approach to the creation of athrombogenic matrices is immobilization of proteolytic enzymes on a solid surface. This article presents an evaluation of methods of chemical immobilization of proteolytic enzymes on the example of chymotrypsin on the surface of solid carriers which can be used for hemosorption. Studies were performed on silochrome with pore diameter 200mm, activated carbon fibers, cellophane and sefarose 6B as balls with pore diameter 2-3mm. A comparative study of the influence of various methods of activation of the surface of the silochrome on the quantity of immobilized protein and its activity was performed. It was established that silochrome is the best carrier for immobilization of chymotrypsin. The optimal methods of chemical activation of its surface are modification with cyanuric chloride and glutarodialdehyde. Immobilization of a small quantity of active chymotrypsin increases the sorption of cholesterol and its atherogenic complexes from the blood plasma, improves hemocompatibility and decreases the sorption of thrombocytes. References 18: 10 Russian, 8 Western.

UDC 535.41:577.11

Capabilities of Holographic Interferometry for Study of Electrophoresis of Biopolymers

18400365E Moscow BIOTEKHNOLOGIYA in Russian Vol 4 No 6, Nov-Dec 88 (manuscript received 9 Feb 87) pp 776-780

[Article by R. R. Gareyev, G. A. Koganov, A. I. Kalyutik, Kaliningrad State University]

[Abstract] Methods now used to monitor electrophoretic processes are of limited accuracy. Methods using staining, fluorescence, autoradiography, as contact methods, influence the results of separation and the native properties of the biopolymers, do not provide visual monitoring of the dynamics of mass transfer processes in the separation system. This article suggests a device with a holographic interferometer which provides noncontact monitoring of the process of separation of biopolymers by the electrophoretic method. The device can determine the location and rate of motion of zones

during electrophoretic separation in real time, as well as the distribution of protein concentration and mass within and between zones. The instrument suggested is a combination of a dual-beam holographic interferometer with a sloping reference beam operating in real time and an electrophoretic separator operating with a horizontal gel plate. Interferograms are presented. The experimental and calculated data agree well, indicating that the device can be used to study the dynamics of mass transfer processes in real time. Figures 4; References 3: Russian.

UDC 547.993

Resistance of Vasoactive Peptides of Vespa Orientalis Venom to the Action of Proteolytic Enzymes

18400377a Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 5, Sep-Oct 88 (manuscript received 16 May 88) pp 658-661

[Article by A. A. Kolmakova, V. M. Lvov and A. Akhunov, Institute of Bioorganic Chemistry imeni Acad. A. S. Sadykov, Uzbek SSR Academy of Sciences, Tashkent]

[Abstract] An analysis was conducted on the susceptibility to proteolytic inactivation of two peptides isolated from the venom of the hornet Vespa orientalis, in order to determine the reasons for their prolonged hypotensive action relative to bradykinin. Peptide II, a close structural analog of bradykinin, has the sequence Val-Pro-Arg-Pro-Pro-Gly-Phe-Ser-Pro-Phe-Arg, and peptide I the sequence Phe-Leu-Arg-Ile-Ala-Gly-Leu-Leu-Leu-Lys-Ala. Analysis of the degradation kinetics with chymotrypsin, carboxypeptidase B, and kininase II indicated that the prolonged hypotensive effect of peptide II was due to less efficient proteolytic inactivation due to the presence of the additional N-terminal amino acids -Val-Pro-. In the case of peptide I the prolonged action vis-a-vis bradykinin was attributed to the presence of the C-terminal sequence -Leu⁹-Lys¹⁰-Ala¹¹ in lieu of -Pro⁷-Phe⁸-Arg⁹ seen in bradykinin. Figures 1; references 10: 5 Russian, 5 Western.

UDC 577.1.112

Isolation of Alpha-Latrotoxin From Venom of Spider Latrodectus Tredecimguttatus by Affinity Chromatography

18400377b Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 5, Sep-Oct 88 (manuscript received 3 Feb 88) pp 679-682

[Article by B. Z. Dalimov, Sh. K. Kasymov and Sh. I. Salikhov, Institute of Bioorganic Chemistry imeni Acad. A. S. Sadykov, Uzbek SSR Academy of Sciences, Tashkent]

[Abstract] A comparative analysis was conducted on the isolation of alpha-latrotoxin from the venom of the

spider *Latrodectus tredecimguttatus* by means of immunoaffinity columns relying on intact antibody molecules and their F_{ab} fragments. In the former case the columns were prepared by linking the antibody to a protein A-Cellopore support, and in the latter case the F_{ab} fragments were conjugated to Cellopore activated with epichlorhydrin and iodoacetamide. The F_{ab} -Cellopore system was found superior to the Antibody-Protein A-Cellopore system, yielding the toxin as a single, narrow peak on elution with 0.01 M HC1 in 0.15 M NaCl, pH 2.2. The capacity of the former was, in addition, 180 mg toxin per 1 gm of the adsorbent, and of the latter 1.8-fold lower, at 100 mg toxin per 1 gm adsorbent. Chemical analysis of the immunologically pure alpha-latrotoxin showed that isoleucine was the N-terminal amino acid. Figures 1; references 11: 6 Russian, 5 Western.

UDC 577.1.112

Biospecific Sorbents for Isolation and Purification of Active Antibody Fragments Against Alpha-Latrotoxin

18400377c Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 5, Sep-Oct 88 (manuscript received 16 May 88) pp 685-687

[Article by B. Z. Dalimov, Sh. K. Kasymov and Sh. I. Salikhov, Institute of Bioorganic Chemistry imeni Acad. A. S. Sadykova, Uzbek SSR Academy of Sciences, Tashkent]

[Abstract] A brief description is provided of the preparation of active antibody fragments specific for alpha-latrotoxin. The essential features consisted of digestion of the antibody molecules with immobilized pepsin, and the use of protein A-Cellopore adsorbents for the removal of Fc fragments and intact molecules. Gel chromatography confirmed the efficiency of the process in providing a pure preparation of active $F_{(ab)}^2$ fragments. The $F_{(ab)}^2$ fragments may be employed for one-step chromatographic isolation and purification of alpha-latrotoxin, as well as for therapeutic purposes as antivenins. In the latter situation they offer considerable advantages in that the problem of molecular aggregation is precluded. References 6: 4 Russian, 2 Western.

UDC 579.873.6:017.7:577.152.34

Production of Fibrinolytic Proteinases by Combined Immobilized Cultures

18400378a Moscow MIKROBIOLOGIYA in Russian Vol 57 No 6, Nov-Dec 88 (manuscript received 22 Sep 87) pp 945-951

[Article by N. S. Yegorov, N. S. Landau and I. B. Kotova, Moscow State University imeni M. V. Lomonosov]

[Abstract] An analysis was conducted on the factors predisposing to maximum yields of fibrinolytic proteinases in combined immobilized cultures of *Nocardia minima* (proteinase producer) and *Arthrobacter citreus* (polysaccharide stimulant producer). Evaluation of the data derived for co-immobilization and mixed immobilization in a series of gel systems (calcium alginate, polyacrylamide gel, polyvinyl alcohol gel) pointed to the former approach as constituting an optimum system. In the case of mixed immobilization the stimulating factor produced by the *Arthrobacter* has to overcome three barriers before reaching the target *Nocardia* cells: the gel matrix in which the *Arthrobacter* is imbedded, the nutrient medium, and the gel matrix in which the *Nocardia* is imbedded. As a result, there is considerable time lag in reaching the target cells for optimum physiological effect, and part of the stimulant is lost in the gel and the medium. Co-immobilization with small inocula allows for cell growth to reach optimum concentrations consonant with a physiological equilibrium ensuring optimum function of both strains. While the time required to reach maximum production of fibrinolytic proteinases is obviously delayed (by 24-48 h in calcium alginate; 48-96 h in polyvinyl alcohol; 48-144 in polyacrylamide), the optimum steady-state conditions that are eventually established assure long-term production of the desired end product. Figures 4; references 15: 8 Russian, 7 Western.

UDC 577.15.07

Preparation of Bacterial Luciferase for Bioluminescent Assays

18400379a Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 24 No 6, Nov-Dec 88 (manuscript received 9 Mar 87) pp 745-753

[Article by V. S. Bondar, Ye. S. Vysotskiy, V. V. Zavoruyev, V. V. Mezhevikin and A. A. Raybekas, Institute of Biophysics, Siberian Department, USSR Academy of Sciences, Krasnoyarsk]

[Abstract] Cursory technical details are provided on the preparation of luciferase from *Photobacterium leio-nathi*, suitable for use in bioluminescent analyses of NAD(P)H levels and activities of NAD(P)-dependent dehydrogenases. The fundamental approach consisted of cell disruption by freezing for 3-4 days at -15°C and thawing. Subsequent steps involved clarification by ultracentrifugation, precipitation with 80 percent ammonium sulfate, and two courses of column chromatography on hydroxyapatite and brushite. The final luciferase preparation was obtained in a yield of 56 percent with a specific activity of 444 U/mg protein. SDS-polyacrylamide gel electrophoresis yielded a preparation with an MW of 88,000 D, consisting of one 42,000 D subunit and one 46,000 D subunit. Figures 5; references 24: 12 Russian, 12 Western.

UDC 577.112.5:591.145.2

Amino Acid Sequences of Neurotoxins RTX-IV and RTX-V of Sea Anemone *Radianthus Macrodactylus*

18400382a Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 14 No 11, Nov 88 (manuscript received 16 Mar 88) pp 1489-1494

[Article by T. A. Zykova, E. P. Kozlovskaya and G. B. Yelyakov, Pacific Institute of Bioorganic Chemistry, Far Eastern Department of the USSR Academy of Sciences, Vladivostok]

[Abstract] Conventional techniques of protein chemistry were utilized in sequencing neurotoxins RTX-IV and RTX-V of the sea anemone *Radianthus macrodactylus*. The results were tabulated for both peptides indicating that they constitute a novel category of toxins. The N-terminus in toxins IV (48 amino acids) and V (47 amino acids) was represented by glycine, and the C-terminus by lysine. In addition to the positively charged C-terminus, the presence of a tyrosine moiety at position 25 was also shown to be important for their toxicity. Figures 3; references 29: 6 Russian, 23 Western.

UDC 577.213.3

Amplification of Two Segments of the Human β -Globin Gene by Means of Polymerase Chain Reaction

18400382d Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 14 No 11, Nov 88 (manuscript received 14 Jul 88) pp 1577-1579

[Article by Ye. I. Shvarts, O. K. Kaboyev, A. A. Goltsov, S. V. Vinogradov*, Ye. N. Lebedenko and Yu. A. Berlin*, Leningrad Institute of Nuclear Physics imeni B. P. Konstantinov, Gatchina, Leningrad Oblast, and the *Institute of Bioorganic Chemistry imeni M. M. Shemyakin of the USSR Academy of Sciences, Moscow]

[Abstract] The polymerase chain reaction was used to synthesize and amplify two fragments of the human beta-globin gene known for high mutagenicity and, accordingly, implicated in the pathogenesis of thalassemia. Successful amplification of both fragments (260 bp and 329 bp) was obtained with the use of thermostable DNA-polymerase derived from *Thermus thermophilus*, using essentially the techniques of DiLella et al. [DiLella, A., et al., LANCET, V.i., pp 497-499, 1988]. Figures 2; references 6 (Western).

UDC 577.113.08

Simplified Method for Isolation of Plant DNA for Research in Molecular Biology and Genetics

18402093 Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR: SERIYA BIOLOGICHESKIH NAUK in Russian No 1, 89 (manuscript received 5 Aug 87) pp 98-100

[Article by G. Z. Yermak, O. Yu. Urbanovich and M. I. Prosnjak, Institute of Genetics and Cytology, Belorussian SSR Academy of Sciences]

[Abstract] A simplified method has been devised for the extraction of plant DNA which bypasses the need for prolonged (2-5 h) centrifugation at 150,000 g in expensive and not readily available ultracentrifuges. In studies dealing with four-day-old etiolated barley and oat shoots, isolation of the nuclei was followed by their lysis in a buffer system consisting of 0.2 M NaCl, 1% SDS, and 0.01 M tris-HCl, pH 7.8 (25-50 ml buffer per 100 g shoots). CsCl was added to the lysate to equal the buoyant density of DNA, and the lysate was then centrifuged at 11,000 g for 1 h, using K-24 centrifuge with 12 x 11 rotor (mLW; GDR). Proteins and cell debris were removed as a plug, while DNA in the lower transparent phase was precipitated with either 2 volumes of isopropanol or 5 volumes of ethanol. Electrophoretic analysis showed that the DNA preparation consisted of 50,000 bp fragments with D_{260}/D_{280} of approximately 1.8, in a yield of 1 mg/100 g shoots. The resultant DNA was suitable for nick translations and blot hybridization, pointing to the utility of this method for isolation of plant DNA. Figures 1; references 2 (Russian).

Discussion of Bioelectronics

18400327 Moscow TEKHNIKA-MOLODEZHI in Russian No 1, Jan 89 pp 15-17

[Article by Grigoriy Lvov, engineer, under the rubric "Window to the Future": "Biologists Are Building Computers"; first paragraph is source introduction]

[Text] Recently scientists have been looking for ways to develop bioelectronic computer hardware—ultrahigh-speed and ultraminiaturized devices that utilize biological material or biological principles of system function. This journal has already published data on that subject (TEKHNIKA MOLODEZHI, 1985, No 5; 1987, No 7); but considering the interest shown by our readers, we are again returning to it.

Would the biocomputer elements crawl all over the corners when the boss is out of the room? If such a question were posed to a specialist, he would surely laugh. After all, the bioelectronic instruments of the very near future are not an artificial likeness of the brain, or living organisms, or even the most elementary cells. They are merely devices built of large and complex organic molecules. From all appearances, they will not differ externally from the usual microcircuits (or, as it is often said in the American style, chips)—that same small unit with dozens of outputs.

Why on earth did researchers turn to biological material? What is wrong with silicon, on the crystals of which virtually all modern electronics are built? Alas, although the capabilities of semiconductor microcircuits are far from being exhausted, basic limitations are already apparent that nature itself has imposed on their further refinement. It will probably not be possible to reduce the size of an individual element of a semiconductor microcircuit to less than 0.0001 mm or its switching time to less than 0.0000000001 sec. It would seem that those are excellent figures. For today. But tomorrow they could curb development of electronics.

Further progress in the area of computers is related to circuits made up of microscopic elements. The word *microscopic* is not used here figuratively, but in its literal sense. Elements of modern chips—no matter how small they are—are, from a physicist's point of view, still macroscopic, for each consists of trillions of atoms or molecules. Microcircuits are needed whose elements consist of only one or a few molecules. Plans are to use such devices with infinitesimal dimensions and extremely high speed to build computer equipment that is even more efficient.

The usual loss of energy to heat and the radiation of electromagnetic waves can be avoided in circuits that operate, in essence, on the quantum level. The prospects are emerging for effecting utterly new means of data processing. Probably, it is biomicrocircuits that will become the basis of computer systems that have the capacity for associative thinking similar to the human mind, rather than rigid computer logic. But the main

thing is that scientists are counting on the unusual reliability of biomicrocircuits. That is particularly important. After all, the more elements in a microcircuit, the higher the probability of system malfunction. Malfunctions are inevitable in rather complicated devices, and automatic protection devices are absolutely necessary to monitor the progress of calculations, to switch off and restore malfunctioning units, and to perform emergency redistribution of internal resources. Since the structure of semiconductor circuits is specified once and for all when they are synthesized, it is very, very difficult to develop such protective devices for them. Biomicrocircuits are, theoretically, very flexible. It is most likely that they will serve as the basis for computers of the future—self-adjusting, self-repairing and self-learning systems, the structure of which changes as a function of the problem to be solved.

In general, the transition of electronics to the molecular level is possible only with use of biological materials—the molecules of inorganic semiconductors are no good at all for such a task. And this is why. In the microworld, any given process is stochastic, and it is impossible to predict with any certainty how it will proceed in a given concrete instance. That means that, upon delivery of a control signal, a microscopic semiconductor element of a computer may switch in one case and not in another. To put it more simply, one time the computer will display the information, "2 times 2 equals 4," and another time, "2 times 2 equals 5." One might better call such a device an electronic roulette wheel rather than a computer.

Everything happens differently in biological molecules. They consist of tens of thousands of atoms that form complex, branched chains and interact with one another. Virtually all of such a molecule's atoms are involved in any process that takes place in it. And if the response of each "little brick" [chip] to an external factor is, to some extent, random, the molecule, on the whole, responds to a signal in a single-valued manner, by virtue of the interaction among its parts. What else could the developers of computers want?

Biological materials have another advantage. At the present time, billions of chips are manufactured in the world, and in the future, microcircuits will probably constitute the largest-volume industrial product. At that point, the simplicity, inexpensiveness and safety of production will become the deciding factor. In that respect, bioelectronics will be beyond compare. Biological materials are cheap, and they can be produced in unlimited quantities, with a closed, ecologically clean technology; whereas harmful substances must be used in the modern methods of purifying silicon.

The most elementary bioelectronic devices have already been developed and are being mass-produced—biosensors that measure temperature, electromagnetic fields and concentrations of some substances. Their appearance is directly related to the needs of computer engineering. As we know, in any computer, it is necessary to input data, and biosensors can turn out to be an

irreplaceable tool here, supplementing the usual keyboard or magnetic disk. For example, future robots will require not only a high-power computer, but also organs of vision and hearing and even smell.

Most biosensors, as we have just stated, register the content of various substances in a mixture being studied. Previously, such analysis required much time plus complicated equipment. Biosensors can do that virtually instantaneously and with great accuracy, since they are capable of distinguishing between molecules that have very similar structures.

Biosensors vary in design. As a rule, we are dealing with a transistor in which the surface of a semiconductor is coated with a layer of sensitive organic matter. If the molecules of interest to us settle on it, they enter into a reaction and form an electric charge at the surface of the semiconductor. That is detected by instruments. Another type of sensor uses the ability of some biological crystals to change their size and shape. These are special wafers that become elongated or bent in the presence of specific molecules. There are also designs that are more complicated, but they all have the same valuable property: they are small and suitable for taking measurements in the most inaccessible places and under the most difficult conditions.

Nevertheless, biosensors are still inferior to the sensory organs created by nature. After all, the human eye reacts even to one photon of light, while the olfactory receptors of a butterfly react to a single molecule of aromatic substance. In theory, there cannot be any greater sensitivity. This happens because when a single molecule of a substance or a single photon enters a cell, it stimulates in the cell enormous fluxes of charged particles that amplify the signal billions of times over. Many biologists are currently investigating cellular mechanisms of signal amplification. If those mechanisms are identified, an effort will no doubt be made to use them in measurement instruments, including biosensors. Incidentally, there is more. Efforts are already being made to build storage devices with gigantic memory on film made of photo-sensitive molecules. Data are recorded on the film and read by a laser. Both processes can be run simultaneously in the numerous cells of the film, which means that such biomemory will have an extremely high speed of operation.

The idea of biosensors is not, in principle, so new. But development of the element base—i.e., the simplest biological diodes and transistors from which biocomputers will be built—is the next, much more complex phase. There are still many questions about it. From what materials and according to what laws can one develop such elements? How can they be produced on an industrial basis? How can these essentially living, parts be assembled in a device?

Unfortunately, exhaustive answers will not appear anytime soon. But today the main directions of research are already clear. Modern methods of molecular biology

permit manipulation of individual molecules: protein-enzymes are used to cut and paste them at the required sites, to produce thin films, and even assemble chains with a specified structure, connecting link after link to the original molecule.

The first prototypes of future logic bioelements already exist. For example, a molecular diode that allows current to pass in one direction but not in the other can be thought of as a form of chain of three molecules. One of them (the donor) has electrons that can be transmitted, the second (the acceptor) is capable of accepting electrons, and the third connects the two. If such an assembly is placed in an electric field that accelerates electrons in a direction going from the donor to the acceptor, the electrons will flow along the chain. If, however, the field is in the opposite direction, the electrons will not move.

Work is also in progress on molecular transistors. But even if we had already learned how to build transistors, logic elements and memory cells out of biomolecules, the question is, how do we build a computer out of them? Molecular elements can be connected only with conductors of molecular dimensions. And scientists are persistently searching for such conductors. Substances were discovered recently whose molecules form long chains capable of conducting current. They are compounds of the porphyrin class. Their molecules resemble flat rings, with an atom of metal in the center and carbon and hydrogen on the edges. If several rings were stacked one on top of the other, electrons would be able to move from one atom of metal to another along the axis of such a stack. We would have a molecular wire also surrounded by "insulation" consisting of hydrocarbon complexes.

But development of molecular conducting filaments is only half the job, we still have to find a way to use them. After all, two specific molecules that are among billions of others like them have to be connected with such wires, and it is still not clear how this is to be done. Perhaps the incredible selectivity of biochemical reactions will help. Thanks to it, some enzymes that split and connect molecular chains sense the difference between enormous molecules that differ by 1-2 molecules only. These enzymes, which are capable of finding one molecule in the entire volume of a solution and reacting expressly with it, may become microscopic assembly tools. Just imagine, without any involvement of man, the required molecules and connecting points are found, molecular wires are attached—the bioelectronic device assembles itself, like a living, growing organism.

Let us assume that a biocomputer has been built and is in operation. Then another problem arises: the results of its calculations must be displayed on a screen or put out on a printer. How? The signals of biomolecules are so weak that they cannot control the usual electronics; they will have to be amplified by billions of times. Evidently, the same methods will be needed that have been used by nature in bioreceptors.

Thus, there are many problems, but researchers are not giving up. After all, it is worthwhile! Here's just one example of the unique possibilities of bioelectronics.

At the present time, microcircuits are manufactured with so-called planar technology (TEKHNIKA MOLODEZHI, 1988, No 8). What does that mean? A pattern is created on the flat surface of a silicon crystal and is used to etch the necessary topography. Then, the uneven places are converted into computer elements, with the application of special coatings or enrichment with doping agents. Since the connecting paths between elements are in the same plane, they must not intersect. Yet, hundreds of thousands of elements are located on a single crystal, and there are even more connections between them. For this reason, in developing each new microcircuit the designers solve an almost unsolvable problem—they figure out the optimum placement of elements and linking circuits. Such a problem does not arise at all in bioelectronics. Molecular elements and molecular wires can form circuits on thousands or even millions of levels. By escaping from the plane into space one can get rid of all restrictions.

There is a third direction in bioelectronics, which is the most complicated the least developed, but the most attractive. We are referring to the creation of new principles of data processing, new block diagrams for computers.

As we know, there are two types of computers—digital and analog. The former perceive data in the form of a set of numbers, and the processing of those data amounts to simple arithmetic operations. In the latter, information is represented by real parameters—electrical voltages, currents, or even dimensions of mechanical parts. Here the problem is not solved by calculations, but by running a model process that corresponds to the problem set forth. Its outcome is the result.

The difference between analog and digital computers can be explained with a simple example. Let us assume that we need to pick the largest number from a certain group of numbers. One could consider successive pairs of numbers and compare them. When all have been sorted, the problem will be solved. That is precisely how a digital computer functions. But there is another variant. Let us imagine thin sticks that are broken so that their length (on a specific scale, of course) corresponds to the magnitude of the numbers in question. Let us gather them into a bundle and stand them upright on a table. We immediately find the largest number—it will be the symbol-stick that is taller than the others. That is the analog method of solving the problem.

Digital devices are general-purpose machines, analog devices are not; in the former, to solve a routine problem it is sufficient to input a new program in the computer; whereas in an analog computer, we have to alter the design itself. Moreover, it is much easier to obtain the required accuracy of calculations on digital computers. Those two advantages explain the present popularity of digital devices.

However, a digital computer has a basic flaw: the machine has to add and multiply millions of numbers in order to ultimately put out only the two or three needed ones. Such a lack of economy is particularly bad when one has to solve many complicated problems of the same type. An analog computer would do better here. True, a computer that could solve rather complicated problems has not yet been designed. The situation could change radically with development of bioelectronics.

In recent years, complex processes that are described by similar laws have been discovered in various branches of science. They have also been detected in biological systems. The idea was born to use the latter as analog computers. After all, observation of biochemical experiments makes it possible to evaluate the progress of the processes occurring in them.

An analog biocomputer can be compared to the thinking ocean Solaris, in the novel by Lem. Depending on set conditions, various biochemical reactions occur in it, while the appearance or decay of specific substances would signify a particular result of calculations. A reaction that takes place in 1 cm^3 of matter is associated with a change in state of 10^{20} molecules. Roughly speaking, that is equivalent to the same number of switchings of logic elements in a digital computer. For this reason, analog biodevices would be able to outperform any of today's supercomputers in speed of operation and precision. And, since an infinite diversity of biochemical processes is possible in one and the same system, it would be capable of solving the most varied of problems, i.e., it would be universal.

The reader has probably noticed that the words "will be," "will become," "perhaps" have been frequently used in this article. What can we do—bioelectronics is only being born. But the future is not as distant as it seems. Let us recall that the entire history of semiconductor electronics, from the first transistor to modern microcomputers, has spanned about 40 years. Even if we assume that bioelectronics will not develop as rapidly, we do not have to wait so long for the first results.

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UDC 577.37

**Fluorescent Spectroscopy and Radionuclide Probes
in Assessment of Stability of Liposomes Prepared
From Total Lipid Fraction of E. Coli**

*18400375a Moscow BIOFIZIKA in Russian
Vol 33 No 6, Nov-Dec 88 (manuscript received
27 May 85) pp 973-977*

[Article by V. A. Chernyavskiy, N. N. Pashkovskaya, F. T. Amosov and B. P. Nikolayev, All-Union Scientific Research Institute of Highly Purified Biopreparations, Leningrad]

[Abstract] Fluorescent spectroscopy and a radionuclide probe were used in evaluating the stability of small and large liposomes formed from the total lipid fraction of *E. coli* M17. The small liposomes were formed by ultrasonication with encapsulation of fluorescein sodium, and large liposomes were produced with CaCl_2 and EDTA and encapsulation of I-125 labeled albumin, in both cases using conventional methodologies. Studies with both liposomal fractions at 4 and 37°C and Ca ion concentrations ranging from 0.1 to 100.0 mM demonstrated that in both cases stability diminished with increasing concentrations of Ca ions and with rising temperature. In addition, the data revealed that the larger liposomes were much less stable than the small liposomes. The rate of fluorescein sodium release from the liposomes at 37°C was 3- to 5-fold greater than at 4°C. Confirmatory results were also provided by data for small liposomes containing I-125 labeled albumin. Similar results to those seen with the Ca ions were obtained with Mg ions, but not with increasing concentrations of Na ions. The results were interpreted to indicate that the Ca ions form complexes with the heterogenous lipids and enhance phase separation, leading to the appearance of

liquid crystal domains and, thereby, weakening the liposomes. Figures 1; references 11: 5 Russian, 6 Western.

UDC 577.3

**Spectral Characteristics of Intraocular Lenses and
Retinal Damage by Visible Light**

*18400375b Moscow BIOFIZIKA in Russian
Vol 33 No 6, Nov-Dec 88 (manuscript received
1 Sep 87) pp 1035-1040*

[Article by E. V. Yegorova, M. A. Babizhayev, T. A. Ivanina and I. E. Ioshin, Moscow Scientific Research Institute of Eye Diseases imeni Gelmgolts [Helmholtz]]

[Abstract] An evaluation was made of the spectral characteristics of intraocular lenses used in the USSR in comparison with those of the natural human lens, which demonstrated marked differences in transmission in the UV range. While the normal lens derived from a 52-year-old subject blocked UV below about 440 nm, the silicone lens transmitted about 220 nm light and the methylmethacrylate lens transmitted about 300 nm UV light. Electroretinogram (ERG) studies on Wistar rats with implanted intraocular lenses showed that in both cases the a over - and b over - waves on the ERG were depressed to below 10 percent of their baseline amplitudes for some 2 weeks. Ultrastructural studies on the retina showed degenerative changes in both the pigmented retinal layer and the photoreceptors. The formation of osmiophilic granules in the retina suggested lipid deposits and, hence, implicated lipid peroxidation in the pathogenesis. These observations raise serious questions as to the safety of Soviet intraocular lenses since they lack the yellowish coloration inherent in natural lenses and predispose to photodamage of the retina. In addition, it appears that antioxidants may be beneficial in the management and prevention of UV damage to the retina. Figures 3; references 13: 1 Russian, 12 Western.

Physical and Biological Problems of Biosensors Discussed

18400348 Kiev VISNYK AKADEMIYI NAUK
UKRAYINSKOYI RSR in Ukrainian
No 1, Jan 89 pp 4-6

[Editorial "Biosensors: Physical and Biological Problems"]

[Text] Presidium of the UkSSR Academy of Sciences examined the subject of physical and biological problems of biosensors. Presentations were made by a Pro-Rector of the Kiev State University imeni T.G. Shevchenko, Doctor of Physical Mathematical Sciences V.I. Strikh and Department Head, Molecular Biology and Genetics Institute, AN URSR [UkSSR Academy of Sciences], G.V. Yelskaya.

The speakers noted that in the last ten years research and development aimed at creating highly specific and highly sensitive biosensors had been conducted at an ever higher pace in all industrially developed countries. As far as possible results and their effect on S&T progress in most diverse spheres of human activity (biotechnology, medicine, agriculture and monitoring of the environment) are, the sensor technology is assigned the second place, next only to microelectronics.

Special hopes are associated with the development of biosensors based on semiconductor structures, due to high sensitivity of the latter, their miniature size, and the possibility to create multifunctional and multiparameter microsensors and sensors that can receive and process information in a single crystal, so-called "intellectual sensors".

The Molecular Biology and Genetics Institute, AN URSR, and Kiev State University authored our country's pioneer works on the development of microsensors based on semiconductor structures. By now, a comprehensive analysis of principles of developing such sensors has been performed; certain success has been achieved in studying physicochemical mechanisms of functioning of integrated biosensors; methods for producing bioselective matrices using ferments and antibodies have been developed; a prototype of an enzyme biosensor of glucose has been created; and a search for technological approaches to creating micromultisensors with single-crystal data processing is on. This work is conducted in cooperation with scientists at Biochemistry Institute imeni A.N. Bakh, AN SRSSR [USSR Academy of Sciences], and Bioorganic Chemistry Institute, AN URSR.

Success that has been achieved and the accumulated scientific potential have made it possible for the IBMG [Molecular Biology and Genetics Institute], AN URSR, and KGU [Kiev State University] imeni T.G. Shevchenko take part in the formation of the All-Union interagency program of research and development in the field of biosensors and Minmedbioprom SRSR [USSR Ministry of Medical and Microbiological Industry] program of creating specific biosensor devices. In these

programs, the above institutions are head performers of a number of subjects. As a result of fulfilling the above programs, biosensor devices will be developed and implemented in a number of sectors of the national economy, which will make it possible to solve at a new in principle level problems of control of technological processes, diagnostics and curing of diseases and monitoring of the environment.

Academician Secretary of the Biochemistry, Physiology and Theoretical Medicine Department, AN URSR, Academician, AN URSR, G.Kh. Matsuka, Deputy Director of the Semiconductors Institute, AN URSR, Candidate of Physical Mathematical Sciences V.S. Lysenko, Vice President of the UkrSSR Academy of Sciences Academician, AN URSR, V.P. Kukhar and Academician Secretary of the Information Science, Computer Technology and Automation Department, AN URSR, Academician V.S. Mikhalevich took part in the discussion.

Concluding the discussion, AN URSR President Academician B.Ye. Paton noted the need to considerably broaden the front and increase the intensity of the research on the subject. Creation of an agency that would coordinate the effort of scientists working at various institutions should play a large positive part in this matter.

AN URSR President stressed the importance of organizing an interagency seminar attracting a broad circle of professionals, as well as of training appropriate scientific personnel using the capabilities available at the IBMG AN URSR and KGU imeni T.G. Shevchenko. He also stressed the need to work actively at fulfilling All-Union and international programs, and first of all the Integrated Program of S&T Progress of CEMA Member Countries.

B. Ye. Paton said that in starting the work on microsensors one can see a lag behind some countries. The research in this area must be substantially broader and more comprehensive, both in the basic and applied directions. In particular, it is necessary to develop highly specific and sensitive biosensors that are based on various physical principles of signal detection and use various types of biological materials (ferments, antibodies, receptors, cells etc.), as well as new-generation diagnosticums based on multifunctional and multiparameter biosensors.

The Presidium delineated the following main objectives of scientific research on problems of creating biosensors:

- studying physicochemical processes in biosensors based on active semiconductor structures, using ferments, antibodies, receptors, biological membranes, cells and tissues;
- search for new methods for recording the course of biochemical processes that are promising as far as the development of biosensors based on these processes is concerned;

- development of scientific foundations of the technology of manufacturing of biosensors and bioselective matrices, and building laboratory prototypes.

AN URSR Presidium approved a plan of integrated work on the problem of biosensors. According to the plan, one will study physicochemical processes and develop theoretical models of potenti- and amperometric recording of biochemical signals with the help of semiconductor structures, work out the technology of manufacturing base semiconductor structures for biosensors, develop potentiometric field transistor-based enzyme sensors for determining pH and analyzing the content of glucose, urea and penicillin, a biosensor for analyzing alcohol content in biological substances, and a microsensor for simultaneous detection of glucose and urea and determining pH.

In order to combine the research on the problem of biosensors, AN URSR Presidium deems it feasible to create an Interagency Scientific Center on the basis of the Molecular Biology and Genetics Institute, AN URSR, Bioorganic Chemistry Institute, AN URSR, and Kiev State University imeni T.G. Shevchenko. The Center should be charged with the development of long-term research directions, coordination of work, organization of a permanent seminar, attracting professionals from various branches of science, efficient utilization of valuable equipment, and training of scientific personnel.

The Molecular Biology and Genetics Institute and Bioorganic Chemistry Institute have been given an assignment to conduct organizational work aimed at the creation of the Center, present to the head institution on CEMA member countries' program "Bioelectronics" proposals on their participation in section "Biosensors" of this program, and ensure in 1988-1989 specific-purpose utilization of additional appropriations allocated by the Interagency Scientific Council on Problems of Physicochemical Biology and Biotechnology under the auspices of GKNT [USSR State Committee for Science and Technology] and AN URSR for conducting research aimed at the development of biosensors.

UDC 636.32/38:57.089.38

Methods of Culturing and Fertilizing Sheep Oocytes To Produce Transgenic Animals

18400356a Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA
in Russian No 6, Nov-Dec 88 pp 81-82

[Article by A. M. Murzamadiyev, Ye. Ye. Yertayev, R. S. Dzhienbayeva, and A. Amangeldiyev, Experimental Biology Institute]

[Text] Researchers are now devoting a great deal of attention to investigating the possibilities of producing transgenic animals. One of the principal directions in this field involves the production of large quantity of zygotes for micromanipulation primarily by means of

searching for effective methods of increasing the yield of full-fledged embryos by stimulating the functions of the ovaries. A drawback of this method is that the stages of embryos' development cannot be synchronized, which means, consequently, that a considerable number of them are unsuitable for injecting genes.

This problem may be solved by culturing and fertilizing oocytes that have been isolated from the ovaries, with most of the oocytes (after fertilization) being in one and the same stage of embryonic development. The drawback of this method is that the viability of the embryos obtained by the culturing and fertilization in vitro of oocytes is very low. Both in our country and abroad, a total of about 30 lambs and calves have been obtained since 1977.¹⁻⁴

Our purpose is to manufacture zygotes obtained by culturing and in vitro fertilization of oocytes for the injection of a gene.

For the experiments, we took eggs from fine-wooled Kazakh ewes that were located in medium 199 and 20 percent sheep serum, with the addition into the solution of antibiotics (penicillin, 100 U/ml, and streptomycin, 50 µg/ml) and with gas-saturated mixture consisting of 5 percent O₂, 5 percent CO₂, and 90 percent N₂. The times between the sacrifice of the sheep and the placement of the isolated oocytes into the culture medium ranged from 1 to 1.5 hours. Oocytes were isolated from cavitary follicles 1-3 mm in size or larger. Mature egg cells with a well-expressed layer of cumulus cells were quickly transplanted to recipient ewes that had been preliminarily inseminated by fine-wooled Kazakh rams three times over a 24-hour period. The zygotes and embryos were then lavaged from the oviducts of the recipient ewes. Zygotes with well-pronounced male and female pronuclei were obtained from 50 to 60 percent of them. The micromanipulations for the purpose of injecting the genes were performed on the zygotes with a rather well-preserved structure.

Growth hormone genes were injected into the male pronucleus of 75 zygotes. To obtain transgenic lambs, they were transplanted into 24 recipient Edilbayev [edilbayevskoy porody] ewes. Ten of the ewes gave birth and produced one lamb each—four rams and six ewes, with weights of 2.3-5.1 kg. Over the course of a month, the weights increased to a range of 3-4 to 17.1 kg. Similarly, their weight gains during this period were not identical (2.2 to 12 kg). Tests are currently under way to determine their transgenicity. Full-fledged lambs were produced after the growth hormone gene was injected into the male pronucleus.

The method we developed for obtaining a large number of sheep embryos may be of value in the field of genetic engineering to produce transgenic animals.

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UDC 577.213.7

Synthesis and Cloning of Synthetic Zein Gene

18400382b Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 14 No 11, Nov 88
(manuscript received 15 Mar 88) pp 1538-1544

[Article by V. A. Yefimov, A. A. Buryakova, I. N. Pashkova and O. G. Chakhmakhcheva, Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] Chemical and enzymatic methods were employed for the synthesis of a synthetic gene for cZ22B1, a 22 kD protein. Eventually, an 806 bp double-stranded DNA fragment was produced which corresponded to the entire amino acid sequence of cZ22B1. The synthetic steps utilized a modular approach, with the modules linked by the use of phage T4 DNA-ligase, and eventual assembly by cloning in plasmids. Certain changes were introduced into the DNA sequence of the gene to facilitate production of zein proteins enriched in lysine and tryptophan residues. Figures 5; references 12: 3 Russian, 9 Western.

UDC 615.373:578.245].012.6:519.86

Mathematical Modeling of Human Alpha-Interferon Production

18400372a Moscow VESTNIK AKADEMII MEDITSINSKIH NAUK SSR in Russian No 12, Dec 88 (manuscript received 16 Mar 88) pp 74-78

[Article by T. S. Razorenova, V. I. Iovlev, A. N. Stepanov, Al. A. Smorodintsev, G. I. Razorenov and G. A. Poddubskiy, Scientific Research Institute of Epidemiology and Microbiology imeni Pasteur; Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

[Abstract] The development of a production process for securing human leukocyte interferon (INF) at the Pasteur Institute (Leningrad) has led to further studies involving mathematical analysis and modeling in order to enhance the efficiency of INF production. Evaluation of the results obtained in 650 experiments has led to the identification of six key steps that yield INF in activities of 15,000 IU/ml or higher (approaching 32,000 IU/ml). The data demonstrated that for optimum yields, sparing methods should be used in processing the leukocytes, with resort to sedimentation by gravity or with gelatin or dextran for removal of erythrocytes. Lysis of the red cells with ammonium chloride is to be avoided. A simple salt solution should be used in the induction and biosynthesis of INF, such as tricine buffer supplemented with 2 percent human serum from AB donors. The leukocyte suspension should be limited to 3 to 5 million cells per 1 ml and cultured under stationary conditions or with mild mixing on a magnetic shaker. Priming of the biosynthetic step requires 100-500 IU/ml INF, while induction is best provided by partially purified and concentrated Sendai virus with an activity of 80,000 hemagglutination units. Finally, recovery of INF should be conducted no sooner than 18-20 h after introduction of the virus. References 3 (Russian).

UDC 577.112

Analysis of Effectiveness of Expression of Human Interleukin-2 Gene in E. Coli Recombinant Strains

18400365A Moscow BIOTEKHNOLOGIYA in Russian Vol 4 No 6, Nov-Dec 88 (manuscript received 1 Apr 87) pp 699-705

[Article by A. I. Kosikov, S. V. Kostrov, T. V. Chernovskaya, Ye. A. Nosovskaya, O. A. Yeshtokina, S. P. Mazelayastrongin, All-union Scientific Research Institute of Genetics and Selection of Commercial Microorganisms, Moscow]

[Abstract] The technology of production of interleukin-2 is far from optimal. Optimization of biotechnological production of this protein is complicated by the lack of a specific and highly sensitive method for its rapid quantitative determination. This article suggests several methods of immunochemical analysis of interleukin-2, including solid-phase immunoenzyme analysis, immuno-dot and immuno-blotting, and describes the use of the methods for selection of interleukin-2 producing strains, quantitative determination of interleukin-2 during its isolation and purification, and identification of the protein in electrophoretic analysis. The results indicate that immunochemical methods of quantitative determination can replace biological methods, though they will continue to be necessary for monitoring of preparations designed for clinical use. Figures 5; References 13: 2 Russian, 11 Western.

UDC 578.245

Study of Expression of Artificial Human Interferon Gene in Cells of Escherichia Coli
18400365B Moscow BIOTEKHNOLOGIYA in Russian Vol 4 No 6, Nov-Dec 88 (manuscript received 26 Jun 86) pp 706-713

[Article by S. N. Shchelkunov, A. A. Ilichev, All-union Scientific Research Institute of Molecular Biology, Koltsovo, Novosibirsk Oblast]

[Abstract] This article summarizes the results of experiments conducted by the authors and others on the expression of the artificial interferon gene in various genetic structures and *E. coli* cells. Proper selection of the recipient strain of microorganism is important in the creation of an effective strain to produce eucaryote proteins. The selection of the expressing vector largely determines the success of work in the creation of strains for the production of foreign proteins. The plasmid pBR327 is preferable to the more commonly used pBR322 as a vector. The hybrid phages of series M13mb yield a higher level of interferon production in *E. coli* cells than hybrid DNA molecules based on pBR327. The plasmid pEMB101 which the authors have created allows insertion of promotors before the interferon gene and analysis of their functioning in tests of the stability of the plasmid-containing cells to tetracycline. An interesting trend for the future is the creation of expressing-secreting vectors. Figures 4; References 34: 13 Russian, 21 Western.

UDC 577.214.625

Cloning of the PGK1 Gene of Saccharomyces Cerevisiae and Construction of Expression Vectors
18400365C Moscow BIOTEKHNOLOGIYA in Russian Vol 4 No 6, Nov-Dec 88 (manuscript received 1 Aug 86) pp 714-718

[Article by K. V. Sasnauskas, A. V. Shpokauskas, A. A. Yanulaytis, "Ferment" Scientific Production Union, Vilnius]

[Abstract] One of the key components of specialized vector systems for effective expression of cloned heterologic genes consists of the regulatory areas, capable of supporting effective expression of the genes connected with them. The gene PGK1, which codes the primary sequence of 3-phosphoglyceratekinase, has been cloned in several laboratories. Its regulatory areas are used to construct expression vectors in yeasts. This article discusses results of cloning of the gene PGK1 and construction of vector plasmids containing its regulatory areas. In order to obtain the expression vector in the yeasts in the creation of recombinant plasmids, it was necessary to introduce elements supporting their replication and selection in *S. cerevisiae*. In order to assure a high level of expression of a foreign gene in yeast cells, the gene must be under the control of highly effective yeast elements, which is achieved by the use of sandwich vectors. The vector plasmids of this class obtained by the authors allow the promotor to be used to study the expression of heterologic genes and to achieve superproduction of the proteins they code in the yeasts. Figures 4; References 17: 3 Russian, 14 Western.

UDC 614.7:[615.285.7:615.33]-07

Hygiene Problems of Environmental Protection in Context of Production and Use of Microbiological Pesticides

18400383 Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 88 (manuscript received 22 Jul 87) pp 52-54

[Article by V. V. Korolik, M. A. Kalugina, and T. S. Telesheva, II Moscow Medical Institute imeni N. I. Pirogov]

[Text] During the past decade, many countries (including our own) have set up the production and the broad use of biological preparations in the form of microbial pesticides. Microbial preparations are microorganisms (bacteria, fungi, viruses, etc.) or natural, highly biologically active chemical compounds (toxins, antibiotics) that are produced by microorganisms.

Party and governmental directives in our country have stipulated a significant increase in the production of microbial preparations.²⁰

In view of this, hygienists are now faced with the urgent need to study and prevent any possible harmful effect by microbial pesticides on the environment and human health. It should also be emphasized that various authors have expressed conflicting opinions regarding the hygiene aspects of producing and using microbial preparations. Some feel that microbial pesticides are not harmful to warm-blooded animals and humans.^{1,16,17,21,24,25,29,33}

At the same time, a great deal of research by other authors indicates that the microbial preparations being produced and used may, under certain conditions, cause toxic alimentary infections, liver damage, allergic reactions, lesions of the conjunctivae, and changes in the blood in laboratory animals and humans and that they may exert a fibrogenic effect, etc.^{2,4-7,18,26,27,30-32}

The literature is also inconsistent with regard to the effect of microbial pesticides on the state of the environment. A number of authors deny the need to study this aspect or to establish standards for microbial preparations in things that are part of the environment (in food products, soil, and water), citing the inability of entomopathogens to multiply in animal bodies, their low pathogenicity, and the small extent to which they contaminate the environment as a result of their rapid dying off in the soil, in water, and in plants.^{11,13,17}

Other researchers feel that determining the possible consequences of the effect of biological preparations on the environment is an urgent hygiene problem since producer microorganisms can cause shifts in the ecosystem.^{3,19,23,28}

The conflicting data presented indicate that the problem has not been studied adequately. Moreover, all

researchers note that the environment is heavily contaminated by microbial pesticides when they are being produced and used. The air is polluted by atmospheric releases at enterprises involved in microbiological synthesis as well as when microbial preparations are used for treating farm lands and forest plantings.^{9,10,14} During the tractor application of bitoxybacillin, for example, such intensive atmospheric air pollution was observed that the content of the preparation in the water used by workers to wash their hands, face, and mucous membranes was equivalent to 2.8-249 million microbial bodies per square centimeter of skin.

The air in the workplace at enterprises in the microbiological industry may be massively contaminated by microbial preparations. In the production of microbial insecticides based on *Bac. thuringiensis* (entobacterin, dendrobacillin, etc.), for example, contamination of the air of the workplace reached 200,000 to 250,000 microbes per cubic meter.¹⁵ Considerable pollution of the air in the workplace has also been found in plants producing boverin. Pollution of the air by the microorganisms that we have alluded to facilities the occurrence, in the workers involved in production, of various pathological processes associated with changes in the body's immune response and the occurrence of toxic alimentary infections, inflammatory diseases of the respiratory organs, and skin diseases.^{5,22,23}

Pollution of water reservoirs by microbial preparations occurs when agricultural crops are treated as well as when enterprises of the microbiological industry dump their waste water. Moreover, the secondary pollution of water bodies is also possible when the preparations are washed from vegetation and soil surfaces by atmospheric precipitation and flood waters. At the same time, aspects of, for example, the pollution of water reservoirs by microbial preparations and their effect on the microbial self-cleaning processes of water reservoirs are only beginning to be studied. This problem has been researched with respect only to certain bacterial pesticides (carnecin, bactorodencide), for which standards in reservoir water have been developed.¹⁹

A substantial amount of pollution by microbial pesticides occurs during the treatment itself of farmlands and forests as well as after microbial preparations have been washed from vegetation surfaces by atmospheric precipitation and flood waters. After microbial preparations have been applied, their content in the soil reaches hundreds of thousands and millions of microbial bodies per gram of soil.⁸ As for the possible effect of microbial preparations on, for example, processes of the self-cleaning of soil and on its sanitary state, these problems, like those of the self-cleaning of water, have as yet only been studied in relation to certain biological preparations—entobacterin and dendrobacillin.¹²

We have established that the pollution of soil by massive quantities of *Bac. thuringiensis* spores does not suppress the soil's self-cleaning processes and, from that standpoint, need not be taken into account when hygiene

regulations are being formulated for the use of the insecticide. This conclusion may not, however, be applied to other microbial pesticides without the appropriate research.

Based on the few data that are now available, several possible consequences of intensive environmental pollution by microbial preparations may be hypothesized: 1) the emergence of new diseases and intoxications, as well as an increase in the frequency of as yet little-studied diseases, stemming from reduced macroorganism resistance and the sensitizing effect and increase in virulence of pathogenic and conditionally pathogenic microorganisms, etc.; 2) a disturbance of the local ecosystem leading to a change in self-cleaning processes, to a reduction in soil fertility, etc.; and 3) an increase in the survival times or the intensified breeding in the environment of pathogenic microorganisms because of suppression of the self-cleaning processes in water reservoirs and soil.

The complexity of the problem of pollution of the environment by microbial pesticides stems from the fact that the generally accepted methods of hygiene regulation of harmful substances based on their toxic properties are unsuitable for microbial preparations. We need to focus not on the toxicity of the preparations, which is most often quite negligible, but on a number of other factors—the pathogenicity of producer cultures, their allergen properties, their possible effect on the body's resistance, their effect on intestinal microflora, etc. In studying microbial preparations based on strains of the genus *Pseudomonas*, for example, T. G. Omelyanets¹⁹ established that the preparations did not cause an infectious process in the body and did not have any toxic effect. At the same time, experiments have proved the capability of those preparations to irritate the mucous membranes, alter the body's immune response, and affect the macroorganism's biocenoses and its microflora, which results in a weakening of the autoflora's protective properties with regard to pathogenic and conditionally pathogenic microorganisms.

As for environmental protection in the context of pollution of the environment by microbial pesticides, studying the long-term consequences for the planet's ecosystem is most important. In addition, the ecological and ecologicobiochemical aspects of the problem have remained virtually undeveloped. We must also admit that the agencies of the sanitation and epidemiological service, in its day-to-day operations, does not devote enough attention to monitoring microbial pollution of the environment. That is primarily because sanitary-hygiene documents dealing with the monitoring of environment pollution during the production and use of biological preparations have been developed for not nearly all preparations. It is also related to the fact that the methods of sanitary-microbiological monitoring are labor-intensive for practical laboratories.

In view of the aforementioned, comprehensive research must be undertaken to study problems of environmental

protection and human health with regard to the production and use of microbial pesticides.

The main tasks that, in our view, must be given top priority are as follows:

1. The development of methods—above all, express methods—for tracking the presence of producer bacteria in environmental targets.
2. The study of the possibility of transformation in producers of biological preparations and the appearance of pathogenic properties in them.
3. The study of the indirect and long-term consequences of the effect of a set of factors related to microbiological products on human health.
4. Research of the migration of producer bacteria in nature.
5. The study of the effect of bacterial pesticides on the natural microflora of the environment and on the self-cleaning processes of water and soil.
6. The study of the effect of bacterial preparations on the viability of pathogenic and conditionally pathogenic microorganisms in the environment.
7. The development of measures to prevent the negative effects of bacterial pesticides on the environment and on human health.

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Territorial Distribution of Lung Cancer in Kirgizia
*18400313a Frunze ZDRAVOOKHRANENIYE
KIRGIZII in Russian No 6, Nov-Dec 88 pp 16-19*

[Article by R. Azykbekov, Kirgizia Scientific Research Institute of Oncology and Radiology]

[Abstract] A study was made of the territorial distribution of lung cancer in Kirgizia for the period 1970-1979, based on information concerning 3,607 patients, a figure that represents 94.7 percent of all individuals with first-time diagnoses of lung cancer. Medical documentation was taken from the Kirgizia Scientific Research Institute of Oncology and Radiology and from oncology facilities in Osh, Przhevalsk, and Tokmak. Lung cancer was confirmed in 3,469 individuals. Standardized indicators were computed to eliminate the influence of possible sex and age differences. The data showed morbidity to average 10.5 + 0.18 per 100,000. Figures varied widely, however, with almost a 9-fold difference, for example, between morbidity in Frunze and morbidity in the Naryn Oblast. The greater morbidity of lung cancer in Frunze and other urban centers was probably due to higher concentrations of industry and resultant higher levels of air pollution, as well as higher percentages of Europeans, in whom lung cancer is more frequent. The incidence of lung cancer in Frunze was considerably higher than the republic average, whereas in the Issyk-Kul'skiy, Osh and Naryn oblasts it was considerably lower. Figures 1.

UDC 616.441-006.6-036.1-07

Thyroid Cancer in Region with Endemic Goiter
18400317b Moscow SOVETSKAYA MEDITSINA in Russian No 11, Nov 88 (manuscript received 26 Nov 87) pp 113-115

[Article by V. A. Privalov, I. D. Levit, A. A. Saprykin, S. A. Vasilyev and S. V. Yayıtsev, General Surgery Clinic, Chelyabinsk Medical Institute; Chelyabinsk Oblast Endocrinologic Outpatient Clinic]

[Abstract] A retrospective case study was conducted on 9,845 patients who underwent thyroid surgery between 1969 and 1986 in Chelyabinsk Oblast, a region with endemic goiter, to determine whether a relationship exists between goiter and thyroid cancer. Histopathologic examination demonstrated that 13.9 percent of the patients had cancer of the thyroid gland, with women predominant (1,239 as opposed to 134 men), and most of the oncologic cases consisting of urban dwellers 20-49 years old. Most of the cancers were classified as papillary (74.7 percent), followed by follicular (19.1 percent), medullary (4.1 percent), and anaplastic (2.1 percent) forms. No relationship could be discerned between the decline in the incidence of goiter in the region and the apparent increase in the incidence of thyroid cancer. The study also revealed that in 2.1 percent of the cancer cases Hashimoto's thyroiditis was present. However, a 3-5

year followup of 400 patients with Hashimoto's thyroiditis showed that none developed thyroid malignancy. References 14: 10 Russian, 4 Western.

UDC 616.98.579.881.11]-036.2:619

Epidemiologic Projection of Q Fever Foci in Herds

18400368a Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLLOGII in Russian No 11, Nov 88 (manuscript received 19 Dec 87) pp 51-56

[Article by A. B. Dayter, N. A. Rybakova, N. K. Tokarevich, V. I. Samitova and B. V. Limin, Leningrad Scientific Research Institute of Epidemiology and Microbiology imeni Pasteur]

[Abstract] A retrospective epidemiologic study was conducted in a non-chernozem region in an attempt to define the etiology of an outbreak of respiratory disease in 1985-1986. The study encompassed a review of 212 case histories and serologic evaluation of 155 patients and hundreds of meat-packing-plant workers and individuals who come in contact with livestock. The data demonstrated that the etiologic agent was Coxiella burnetii, initially contacted by 172 workers at a sheep farm. At the time of the outbreak, only 28 of the patients were diagnosed correctly. Of those originally infected, 62.8 percent were males, reflecting occupational exposure. These findings pointed to the need for greater clinical alertness to the problem of Q fever, as well as the need for closer veterinary monitoring—with primary emphasis on laboratory techniques—in assessing the health status of sheep vis-a-vis Coxiella burnetii. References 12: 8 Russian, 4 Western.

UDC 616.3.6-002.022.7:578.89]-008.97-07:616.153.962.4-097-078.73

Incidence of Marker Detection in Individuals Infected With Hepatitis B Virus in Rustavi (Georgian SSR)

18400369c Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLLOGII in Russian No 12, Dec 88 (manuscript received 11 Nov 87) pp 78-81

[Article by O. V. Chubinishvili, M. I. Mikhaylov, L. A. Sakvarelidze, T. I. Chikviladze and L. G. Baidoshvili, Georgian Antiplague Station, USSR Ministry of Health, Tbilisi; Institute of Virology imeni D. I. Ivanovskiy, USSR Ministry of Health, Moscow]

[Abstract] An epidemiologic study in Rustavi, Georgian SSR, showed that of the 1,087 patients hospitalized for viral hepatitis between May 1985 and May 1986, 36.4 percent were serologically positive for HBsAg. An additional 6.6 percent tested positive for IgM against HBCAg. Studies on 372 donors showed that 55.2 percent were

positive for HBsAg, anti-HBsAg and/or anti-HBcAg, and that the overall infectivity for medical personnel was 40.5 percent (reaching 54.8 percent in those with 16 and more years of occupational exposure). Evaluation of the sera of 2,356 pregnant women showed that 2.5 percent were HBsAg positive, with 20 percent of that positive group also

positive for HBeAg. In general, the population of Rustavi, especially medical personnel, was shown to be at high risk of viral hepatitis. In view of these findings, an active immunization campaign should be encouraged for medical personnel, including students entering medical institutes. References 11: 8 Russian, 3 Western.

UDC 575.223:582

Induced Reversion to Growth and Developmental Dominance in Plants

18400376 Moscow *GENETIKA* in Russian
Vol 24 No 11, Nov 88 (manuscript received
12 Mar 87) pp 1980-1985

[Article by G. F. Privalov and I. A. Yakovleva, Institute of Cytology and Genetics, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] The combination of desirable and recessive traits in a given strain constitutes a prerequisite for successful breeding programs, with recent studies on induced reversions in plants pointing to the utility of this approach in securing such combinations. Studies with wilty dwarf mutants derived from Pushkin tomatoes, which are homozygous for the *wd* gene, and are only $\frac{1}{3}$ the height of Pushkin plants, were selected for an assessment of the mutagen-induced reversion phenomenon. The results showed that exposure of the seeds to 1, 3, or 15 Gy x-ray doses yielded reversion frequencies of 2.6, 3.4, and 2.0 percent; to 3 Gy gamma-ray irradiation, a reversion frequency of 0.5 percent; to 0.1 percent hydrazine, a frequency of 0.1 percent; to 0.012 percent NEM [sic] solution 0.1 percent, with 0.1 percent acridine orange, 0.35 percent reversions; and to wetting with water for 16 h, a frequency of 6.3 percent. The reverted plants were dominant for increased cell turgor, rapid growth, high productivity, and greater viability and were believed to reflect transition from the recessive *wd* gene to the dominant *Wd* state. In addition, the reversion plants exceeded the original Pushkin variant in terms of productivity 1.5- to 2-fold. Treatment of seeds with 0.01 percent gibberellin solutions was found to be an efficient indicator of plant susceptibility to mutagen-induced reversion. The wilty dwarfs responded in a negative

manner, i.e., reduced growth due to seed treatment with gibberellins, and yet were highly susceptible to mutagen-induced reversion. Plants responding positively to gibberellins, i.e., with greater plant growth, failed to produce valuable varieties in the M₂ generation after mutagen treatment. References 19: 17 Russian, 2 Western.

UDC 595.1

Restriction-Modification System PaeD253 Determined by Biodegradation Plasmid pBS253 of *Pseudomonas Aeruginosa*

18400395a Moscow *DOKLADY AKADEMII NAUK SSSR* in Russian Vol 304 No 6, Feb 89 (manuscript received 28 Sep 88) pp 1472-1474

[Article by A. M. Boronin, V. V. Kochetkov, L. A. Kulakov, G. A. Tusupbekova and R. M. Aliyeva, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast; Gorkiy Scientific Research Institute of Epidemiology and Microbiology; Institute of Microbiology and Virology, Kazakh SSR Academy of Sciences, Alma-Ata]

[Abstract] Studies on the incompatibility characteristics of the plasmid pBS253, responsible for the degradation of alpha-methylstyrene and toluene and resistance to Hg ions in *Ps. aeruginosa* BS176, suggested that a restriction mechanism was functional against the other resistance plasmids. Confirmatory studies were conducted with *Ps. aeruginosa* bearing pBS253 and free of the plasmid, showing that in the former bacteriophage replication was restricted. Differences between the restriction patterns exhibited by different plasmids pointed to a novel system designated PaeD253 and determined by pBS253. PaeD253 represents the first restriction system attributed to a plasmid responsible for biodegradation. References 9: 4 Russian, 5 Western.

UDC 612.017.1.06:[612.33.018:577.175.732]

Immunomodulating Properties of Gastrin

*18400331a Moscow IMMUNOLOGIYA in Russian
No 5, Sep-Oct 88 (manuscript received
7 Jul 87) pp 33-35*

[Article by A. N. Cheredeyev, N. N. Vcherashnyaya, Yu. A. Gaydar and T. P. Shamshonkova, Second Moscow Medical Institute imeni N. I. Pirogov; Dnepropetrovsk Scientific Research Institute of Gastroenterology]

[Abstract] A study is presented of the mechanisms of the immunomodulating effects of gastrin, the hormone secreted by epithelial cells of the mucosa of the antral segment of the stomach and duodenum. Studies performed on the blood of 42 healthy donors indicated that the mononuclear cells of the blood contain roughly 19 percent lymphocytes receptive to gastrin-1 and roughly 18 percent cells binding pentagastrin. Among the T-lymphocytes, gastrin receptors were primarily located on cells having receptors for the Fc fragment of immunoglobulin G; these lymphocytes are, of course, T-suppressors and T-killers. Since cells that have the Fc-fragment receptors are also predominant among the non-T-lymphocytes, lymphocytes with gastrin receptors apparently belong primarily to $Fc^+ \gamma$ -lymphocytes that have important immunological functions. Gastrin not only participates in the regulation of the acid-producing function of the stomach, but also acts on the immune system. The immunomodulating influence of gastrin on the multiplication of lymphocytes and on the regulator and effector mechanisms of the immune processes is apparently moderated by the $Fc^+ \gamma$ -lymphocytes which carry gastrin receptors on their cell surfaces. References 7: 5 Russian, 2 Western.

UDC 617.51-001-036.17-06:[616-092:612.017.1.064]-085.275.4

Development of Immune Deficiency After Severe Craniocerebral Trauma and its Correction by Tactivin (Experimental Study)

*18400331b Moscow IMMUNOLOGIYA in Russian
No 5, Sep-Oct 88 (manuscript received
12 Oct 87) pp 87-89*

[Article by N. I. Lisyanyy, A. A. Radziyevskiy and I. V. Filchakov, Scientific Research Institute of Neurosurgery, Ukrainian Ministry of Health, Kiev]

[Abstract] T-system immune deficiency develops after craniocerebral injury, a pathology in which there is virtually always disruption of CNS subcortical structures, which have close direct and reciprocal regulating ties with the immune system. The authors study certain mechanisms of development of secondary immunodeficiency after severe craniocerebral injury and test the possibility of correcting the disorder under experimental conditions with tactivin, a biological immunomodulator which has been used successfully with T-system immune

deficiency of other origins. Studies performed on rats indicated that craniocerebral trauma causes acute and long-term cellular destruction of the central lymphoid organs. The studies revealed a number of features in the formation of secondary immunodeficiency after trauma, particularly that levels of, for example, karyocytes, T-cells, and autorosette-forming cells were at their lowest point 15 days after the trauma. Tactivin was found to be an effective immunocorrector following craniocerebral trauma, essentially normalizing the subpopulational composition of the cells of the lymphoid organs, the thymic serum factor, the delayed hypersensitivity response index, and the proliferative response of the lymphocytes in vitro, particularly on the 15th day, the point of crisis after the trauma. Figures 1, references 5: 4 Russian, 1 Western.

UDC 616.98:578]-092:612.017.1-064:796/.799]-085.281.8:578.245]-039.71

Use of Recombinant α_2 -Interferon in Athletes

18400367a Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 6, Nov-Dec 88 (manuscript received 16 Feb 87) pp 693-697

[Article by F. I. Yershov, Ye. P. Gotovtseva and I. D. Surkina, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences; Central Scientific Research Institute of Biomedical Problems of Sports, Moscow]

[Abstract] Comparative trials were conducted with native human leukocyte interferon (INF-1) and recombinant α_2 -interferon (INF-2) in 40 highly skilled male and female skiers and skaters to test the efficacy of these preparations in preventing cold-type symptomatology. The rationale for the study was based on the established fact that extreme physical and psychological stress in athletes has been shown to be immunosuppressive and to predispose them to viral infections. Treatment of the athletes with INF-1 for 9 days (0.5 ml [64 U] b.i.d., intranasally) or with INF-2 for 9-11 days (0.5 ml [4×10^4 U] b.i.d., intranasally) showed that the treatments led to abatement or prevention of cold-type symptomatology (rhinitis, fever, malaise). In the untreated control group the entire cohort presented with cold-type symptoms lasting for 3 to 5 days; in some cases the catarrhal symptoms were severe enough to disrupt training schedules. In the INF-1 group 44.4 percent of the subjects developed much milder symptoms for 1-2 days, without the need to discontinue training; and in the INF-2 group very limited symptomatology was noted in two cases for about 1 day. Concomitant monitoring of a number of immunological indicators demonstrated that both INF-1 and INF-2 were effective in activation of T-lymphocytes and attendant synthesis of γ -interferon, overcoming the suppression seen in the control subjects. However, the effectiveness of INF-2 was much more pronounced than that of INF-1. The trials with the INF preparations

demonstrated both their clinical usefulness and immunomodulatory efficacy, the latter presumably mediated by the hypothalamus. References 19: 8 Russian, 11 Western.

UDC 615.371:579.861.1].036.8

Field Trials With Liquid Meningococcal Polycomponent ABC Vaccine

18400368b Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLGII in Russian No 11, Nov 88 (manuscript received 9 Oct 87) pp 62-64

[Article by L. A. Levina, Yu. V. Filippov, Yu. P. Vartanyan, Yu. A. Ratiner, V. F. Salov, G. S. Vlasov, N. A. Kryuchkov, V. V. Stoletov, I. B. Khodzhiniiyazov, N. B. Anokhin, A. Ye. Pilko, O. D. Semenov, V. G. Purovets and B. B. Pershin, Central Scientific Research Institute of Vaccines and Sera imeni I. I. Mechnikov, USSR Ministry of Health, Moscow]

[Abstract] Cases of generalized meningococcal infection were monitored to assess the efficacy of a liquid meningococcal trivalent (ABC) vaccine in preventing such complications in young immunized males. The cohort consisted of predominantly 18-20-year-old men immunized by subcutaneous jet injection of either 200 or 400 µg of the vaccine. The follow-up study revealed that 5 men immunized with the 200 µg dose developed generalized meningococcal infection (out of a total of 1966 men immunized), as did 2 men in the 400 µg group (1954 men). The difference between these two groups was insignificant. Furthermore, comparison with the incidence in the unimmunized population also demonstrated that the difference

$$(\chi^2_i = 1,27; p > 0,05).$$

between the immunized and unimmunized individuals was insignificant.

Accordingly, these observations demonstrated that immunization with the meningococcal trivalent ABC vaccine

$$(\chi^2_i = 2,68; p > 0,05).$$

did not protect against generalized meningococcal infections. References 13: 9 Russian, 4 Western.

UDC 615.371:579.841.11].012.07

Protective Synthetic Polysaccharide-Protein Antigens Prepared From O-Polysaccharides of *Pseudomonas Aeruginosa*, Serotypes 1, 2 and 7

18400368c Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLGII in Russian No 11, Nov 88 (manuscript received 18 Sep 87) pp 69-71

[Article by V. A. Kulshin, N. G. Antsiferova, A. F. Moroz and B. A. Dmitriev, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] O-specific polysaccharides (PS) derived from the lipopolysaccharides (LPS) of serotypes 1, 2 and 7 of *Pseudomonas aeruginosa* were coupled to aminated beef serum albumin (BSAS) and tested for immunogenicity. The resultant PS-BBA conjugates were used for immunization of outbred mice subsequently challenged with 2-4 LD₅₀ doses of the homologous *Ps. aeruginosa* strain. Variable degrees of protection were obtained in terms of 5-day survival figures after an initial subcutaneous immunization with either Freund's complete adjuvant or a subimmunogenic dose (10 ng) of the homologous LPS, followed by an additional 2-4 immunizations without an adjuvant at 7-day intervals, with the challenge following by 14 days the last immunization. The survival figures demonstrated that the homologous LPS was far superior to the Freund's adjuvant in enhancing immunity. Furthermore, the importance of the molecular mass of the PS in immunogenicity was shown by the fact that hydrolytic cleavage of PS serotype 7 to change the MW from 50 kD to 10 kD increased the survival figures to 100 percent after 2 immunizations. The survival figure with the native 50 kD PS was 60 percent under otherwise identical experimental conditions. References 11: 4 Russian, 7 Western.

UDC 615.275.4:541.64].012.1

Significance of Low 'Additives' in Immunomodulating Efficacy of Synthetic Polyelectrolytes: Effective Immunostimulation by Polymer-Metal Complexes

18400384a Moscow IMMUNOLOGIYA in Russian No 6, Nov-Dec 88 (manuscript received 8 Sep 87) pp 13-17

[Article by M. I. Mustafayev, A. Sh. Norimov, V. V. Goncharov, S. G. Zavgorodny and T. G. Khanlarov, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] A series of copolymer-Cu⁺⁺ complexes were tested for their effects on antibody response in a (CBA x C57B1/6)F₁ mouse system, involving intraperitoneal administration of the soluble copolymers (50 µg/kg) and SRBC (5 x 10⁶ cells). The study was based on the adjuvant properties of polymers and the fact that polymer-metal complexes possess a variety of physiological properties. The study showed that the complexes under study (acrylic acid + 2-methyl-5-vinylpyridine; maleic anhydride + N-vinyl pyrrolidone; vinyl amine + vinyl alcohol) increase the yield of antibody-forming splenic cells 2- to 5-fold over control values. The copolymers alone were ineffective or of minimal effectiveness. Copper chloride was essentially ineffective, as were the copolymers and copper ions when administered separately. Maximum antibody response was obtained with complexes containing either 1 or 2.5 Cu ions per 100 monomeric units. Physicochemical studies demonstrated that at that ratio the binary copolymer-metal complexes underwent structural transformations into coordinate compounds of the ligand-metal ion type. The latter

demonstrated higher binding affinity for immunocompetent cells and for acting as a bridge between the cell and the antigen. Figures 2; references 16: 12 Russian, 4 Western.

UDC 615.276.4.015.21:615.218.3].012.1

Polyfunctional Molecules: Conjugates of Synthetic Polyion-Immunomodulators with Allergens and Inhibitors of Mast Cell Allergic Activity

18400384c Moscow IMMUNOLOGIYA in Russian No 6, Nov-Dec 88 (manuscript received 12 Oct 87) pp 53-57

[Article by I. S. Gushchin, V. G. Voytenko, B. D. Sviridov, N. L. Bogush, I. S. Litvinov and Ye. F. Panarin, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] In vitro studies were conducted on the effects of a conjugate prepared from a copolymer—an antioxidant that inhibits histamine release from mast cells, and an allergen—on histamine release by mast cells derived from allergic animals as an experimental approach to the immunotherapy of immediate hypersensitivity. The studies involved Wistar rats and (CBA x C58Bl/6)F₁ mice sensitized with ovalbumin (OB) from which the mast cells were derived; 2,6-diphenyl-1,4-benzoquinone (DBQ), an agent that inhibits histamine release by mast cells; and N-vinylpyrrolidone:vinylamine (VP/VA) copolymer with a MW of 89,000 D. A series of experiments demonstrated that a VP/VA-DBQ conjugate was efficient in inhibiting histamine release from mast cells induced by substance 48/80 or ionophore A-23187. In addition, the triple conjugate VP/AV-DBQ-OB was also effective in diminishing histamine release, demonstrating that the stimulatory effect of conjugated OB was significantly less than that of the free OB. ELISA studies demonstrated that the latter effect, i.e., diminished efficacy of the conjugate bearing OB in stimulating histamine release, was not due to diminished accessibility of the OB antigenic determinants to the sensitized mast cells. These observations raise the possibility that it may be possible to control histamine release from mast and other cells in allergic subjects by the use of conjugates of the type described here. Figures 5; references 16: 10 Russian, 6 Western.

UDC 616.98:579.843.95]-092.616-056.43]-07:616.381-008.853.2-078.333

Detection of Elevated Delayed Hypersensitivity to Plague Bacillus by Macrophage Disappearance Test

18400384d Moscow IMMUNOLOGIYA in Russian No 6, Nov-Dec 88 (manuscript received 15 Oct 87) pp 82-84

[Article by G. I. Vasilyeva, Ye. P. Doroshenko, A. K. Kiseleva and V. L. Pustovalov, Scientific Research Anti-plague Institute, Rostov-on-Don]

[Abstract] Albino mice were immunized subcutaneously and intraperitoneally with 100 µg of the FIA antigen of a vaccine strain of the plague bacillus for purposes of assessing of the macrophage disappearance test as an indicator of delayed hypersensitivity. The animals were challenged intraperitoneally with the antigen at various subsequent periods of time and the levels of macrophages in peritoneal exudates enumerated. At the height of the delayed hypersensitivity, a 91-93 percent drop in macrophage counts was regularly noted, and it persisted throughout the 28-day period of observation. Delayed hypersensitivity to the antigen was seen to develop within one day of subcutaneous immunization. These observations confirmed the importance of cellular immunity against plague and the significance of macrophages as effectors. Figures 2; references 14: 8 Russian, 3 Western.

UDC 612.017.1:614.47:616.981.28

Donor Immune Response in Immunization with Staphylococcal Toxoid

18402067b Kiev VRACHEBNOYE DELO in Russian No 2, Feb 89 (manuscript received 30 Sep 88) pp 70-72

[Article by Ye. A. Fedorovskaya and L. V. Nazarchuk, Microbiology Laboratory, Kiev Scientific Research Institute of Hematology and Blood Transfusion]

[Abstract] Current practice for donor immunization with alpha-staphylococcal toxoid consists of two subcutaneous injections of 0.5 ml of the preparation at intervals of 30-45 days. Antibodies are generally determined 14 to 30 days after the last injection. Monitoring of 1,722 donors showed that 82% responded with serum titers of $3.0-6.0 \times 10^3$ IU/ml, with 48.0% of the donors developing titers in excess of 6×10^3 IU/ml. A trial was conducted with 287 volunteers immunized twice with a jet injector at 14-day intervals, to determine whether an improved immune response could be elicited in this manner. With the jet injection the corresponding percentages of moderate and high responders were 66.2 and 19.9%, respectively. On balance, the study demonstrated that both immunization systems are successful in eliciting an anti-alpha-staphylococcal response and should be recommended for use at blood transfusion centers. References 5 (Russian).

Economic Impact of Use of CO₂ Laser in Treatment of Purulent Inflammatory Diseases of Soft Tissue

18400301 Moscow KHIRURGIYA in Russian
No 12, Dec 88 (manuscript received 14 Apr 87) pp 19-21

[Article by Professor O. K. Skobelkin, Doctor of Medical Sciences P. I. Tolstykh, V. A. Derbenev, G. I. Tsyanova, A. V. Gertsen, and V. V. Petushkov, Scientific Research Institute of Laser Surgery, Moscow]

[Abstract] About 15 million working days are lost annually in the RSFSR because of various purulent inflammatory diseases of soft tissue and purulent necrotic complications associated with surgical interventions. Treatment costs run in the hundreds of millions of rubles. The socioeconomic efficacy of the use of the CO₂ laser—thus far the best therapeutic intervention in this area—was evaluated in 500 patients divided into the following five nosological groups (each with 100 patients): abscesses and phlegmons, lactating purulent mastitis, carbuncles and furuncles, ingrown toe nails, and hemorrhoids. Controls consisted of 500 matched patients receiving traditional treatment. The following indices were evaluated: average duration of treatment; savings due to the shorter therapy; overall impact due to compensation payments and liberation of the labor force; economic impact of various expenditures. The treatment period was shown to be shortened by a factor of 1.5-2 with the use of the CO₂ laser, which saved 200,000 rubles in just the 500 study cases. At a purchase price of 22,000 rubles per laser unit, each ruble spent on the acquisition of new equipment would pay back 9 rubles. References: 7 (Russian).

UDC 617.7-007.681-089:615.849.19

Effectiveness of Repeated Laser Trabeculoplasty in Open-Angle Glaucoma

18400311a Moscow VESTNIK OFTALMOLOGII in Russian Vol 104 No 6, Nov-Dec 88 (manuscript received 3 Jun 87) pp 16-19

[Article by Doctor of medical sciences V. S. Akopyan, Candidate of medical sciences Ye. L. Kazakova, All-Union Scientific Research Institute of Eye Diseases, USSR Ministry of Public Health, Moscow]

[Abstract] Laser trabeculoplasty is known to be highly effective in the treatment of open-angle glaucoma, but normalized intraocular pressure generally rises after 2-3 years. A study was performed to evaluate the clinical effectiveness of laser trabeculoplasty on 197 eyes in 173 patients with primary or pseudoexfoliative glaucoma. The initial trabeculoplasty was performed on patients in whom intraocular pressure could not be normalized with medications and was above 22 with Goldman tonometry. Of those patients, all in which normalization of intraocular pressure lasted no more than three month or was not achieved at all were excluded from the second phase of the study. Repeat

laser trabeculoplasty was performed on 33 eyes in 31 open-angle glaucoma patients when the hypotensive effect of the first procedure was felt to have been exhausted, with a chronic rise in intraocular pressure. An average of 100 coagulates were applied the entire circumference of the trabeculum using a 0.8-1.3 W laser with a focal spot diameter pg 50μm and an exposure of 0.1 sec. A Coherent Radiation M-900 laser ophthalmocoagulator was used in the procedure. The results indicated that repeated procedures were no less effective than the initial procedure. The slightly greater reduction in ophthalmic tonus observed following the initial procedures by comparison with repeat procedures is explained largely by the greater intraocular pressure which was present before the first procedures than before the second. Figure 1, references 6 (Western).

UDC 617.736-085.849.19-036.8-07

First Experimental Clinical Use of Continuous (Wave Length 0.532μm) Second-Harmonic Radiation of YAG Laser in Treatment of Macular Pathology

18400311b Moscow VESTNIK OFTALMOLOGII in Russian Vol 104 No 6, Nov-Dec 88 (manuscript received 20 Nov 87) pp 61-65

[Article by Ch. Ye. Apostolov, A. V. Bolshunov, M. O. Belokurova and A. V. Kalinkin, Department of Laser Treatment Methods, All-Union Scientific Research Institute of Eye Diseases, USSR Ministry of Public Health, Moscow]

[Abstract] A study is presented of the possibility of the practical application of the continuous radiation at 0.532μm of the second harmonic of a YAG laser for several types of macular disease. A laser ophthalmologic installation containing a YAG laser with radiation frequency doubling at a wave length of 0.532μm in continuous generation mode was used. The laser radiation was focused on the fundus oculi with a three-mirror Goldman lens. The power of the laser radiation was varied from 100 to 200 mW, with focal plane spot diameter 50, 100 and 200μm and exposure lengths of 0.1, 0.2, 0.4 sec. The normal surgical technic for macular pathology was used. Two case histories are presented, illustrating the genuine possibility of practical utilization of frequency-doubled YAG laser in the treatment of various macular pathologies, at lower cost than that of an argon laser installation. Figures 2, references 8 (Western).

UDC 615.849.19.032.018.5-015.4:616-006.444-033.2

Effects of intravascular Laser Irradiation of Blood on Growth and Metastasis of Lymphosarcoma in Rats

18400337f Moscow BYULLEHEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 10, Oct 88 (manuscript received 20 Oct 87) pp 472-473

[Article by I. Ya. Tsukerman, K. V. Yaremenko and S. K. Ibragimova, Scientific Research Institutes of

Oncology and of Pharmacology, Tomsk Scientific Center, USSR Academy of Medical Sciences]

[Abstract] Therapeutic trials were conducted with intravascular laser irradiation of blood in a rat model system involving lymphosarcoma, in order to determine whether the clinical benefits observed in other cases may also be extended to malignancies. The trials were conducted with Wistar rats bearing subcutaneously implanted Pliss lymphosarcoma cells. After 15 days a fiberoptic probe was introduced into the tail vein for blood irradiation with either a copper (510 nm) or a helium-neon (633 nm) laser, with the procedure repeated on day 16. In terms of tumor mass 25 days after implantation, a reduction of 86-90 percent in the mass was seen in the irradiated rats in comparison with control animals. The frequency of metastases was reduced to 14 percent with the 633 nm laser and to 0 percent with the 510 nm laser (83 percent control value). Finally, the mean weight of lymph nodes per animal, which was 387.4 ± 67.4 mg in the control rats, was reduced to zero in the irradiated rats. Studies on blood smears showed that both forms of laser led to an increase in the absolute lymphocyte counts 16 and 22 days after implantation. Evidently, resolution of the lymphosarcoma was due to laser-enhanced cellular immunity. The benefits obtained with 2 irradiations were more pronounced than those with a single treatment on the 15th day. References 5 (Russian).

UDC 616.71-018.46-002-036.12:[615.831.8+616-089.819.1]

Treatment of Chronic Osteomyelitis of Long Tubular Bones With Carbon Dioxide Laser and Closed Intraosseous Active Lavage

18400353a Leningrad VESTNIK KHIRUGIYA IMENI I. I. GREKOVA in Russian Vol 141, No 11 Nov 88 (manuscript received 26 May 87) pp 45-48

[Article by O. K. Skobelkin, P. I. Tolstykh, and K. D. Durmanov, Scientific Research Institute of Laser Surgery, USSR Ministry of Public Health, Department of Surgical Diseases, Pediatric Department, Alma-Ata Medical Institute, Moscow, Alma-Ata]

[Abstract] The purpose of this work was to develop and clinically evaluate a method of closed intraosseous active lavage of bone cavities in the treatment of chronic long-tubular-bone osteomyelitis by means of carbon dioxide laser radiation. Studies were performed on rabbits to model purulent-necrotic osteomyelitis foci by the introduction of *Staphylococcus aureus*. Surgical treatment was then performed on 70 patients with chronic osteomyelitis. Intraosseous lavage was applied after radical surgery on the osteomyelotic focus in all patients. The major advantage of closed intraosseous active lavage was found to be the negative pressure around the perforated tube, which creates decompression of the wounded bone segment and removes the microflora. Lavage was performed with Ringer's solution at an

osmotic pressure of 25-30 mm Hg, which creates an osmotic gradient of 15-20 mm Hg. Clinical effects were achieved in 92 percent of the cases; recurrences occurred in 7 percent. Reference 1: Russian.

UDC 616.36-008.5-089+615.37+615.849.19

Immunocorrection With Low-Intensity Laser Radiation in Surgical Treatment of Patients With Obstructive Jaundice

18400353B Kiev KLINICHESKAYA KHIRURGIYA in Russian No 9, Sep 88 (manuscript received 22 Aug 86) pp 32-35

[Article by V. S. Zemskov, N. F. Gamaleya, A. F. Makeyev, N. I. Lisyanay, Z. M. Rudykh, and A. V. Protsyuk, Department of General Surgery, Kiev Medical Institute imeni Academician A. A. Bogomolets]

[Abstract] A study is presented of the influence of intravenous laser irradiation of the blood on the immunologic reaction of the organism in patients with obstructive jaundice of nontumor etiology. Seventy-four patients were studied, 58 percent over 60 years of age. A helium-neon laser operating at 632.8 nm wavelength and generating $0.2-0.4$ mW/cm² at the output and a monofilament optical light guide 900 μ m in diameter and 1 m long were used to perform intravenous laser irradiation of the blood after surgical correction of bile flow each day 25-30 minutes per day for 4-10 days. The treatments were found to stimulate normalization of both cellular and humoral immunity and decrease the number of complications and the length of treatment.

UDC 616.31-001.8

Morphological Assessment of Oral Mucosa Following CO₂ Laser Use

18400399b Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOGO SSR in Russian Vol 132 No 1, Oct 88 (manuscript received 22 Sep 88) pp 189-192

[Article by M. M. Shanidze, G. A. Vadachkoriya and K. M. Mardaleishvili, Oncological Scientific Center, Georgian SSR Ministry of Health]

[Abstract] The effects of irradiation from the Skalpel-1 CO₂ laser on the oral mucosa were studied in mature 2.5-3 kg chinchilla rabbits in order to delineate the parameters for clinical use. The power output of the 35 W laser was varied from 20 to 100 percent, using exposure times of 5 sec and 1 min, and distances of the emitter from the mucosa of 1 and 3 cm. Histologic monitoring 5 and 30 days after treatment demonstrated the usual picture of tissue defect, coagulum formation, onset of granulation, and healing. Depth of penetration ranged from 750 μ (with a 20 percent power output and an exposure time of 5 sec) to 3100 μ with a 100 percent power output and 1 min exposure. Evaluation of the

histologic results demonstrated that the optimum exposure time should not exceed 5-6 sec with a power output of 60 percent, at which point a penetration of 1600 μ is attained. Under other conditions a tissue coagulum is

rapidly formed that acts as a barrier to the laser light and requires prolonged exposures or greater power output for any additional penetration with greater tissue damage. Figures 1.

UDC 617-001+617.3]:002:681.3

Automated Information Retrieval System 'Patent' in Traumatology and Orthopedics

18400372b Moscow VESTNIK AKADEMII MEDITSINSKIH NAUK SSR in Russian No 12, Dec 88 (manuscript received 29 Jan 88) pp 78-82

[Article by E. R. Mattis, Central Institute of Traumatology and Orthopedics imeni N. N. Priorov, USSR Ministry of Health, Moscow]

[Abstract] "Patent" is the designation accorded a novel automatic information retrieval system designed to facilitate patent searches of literature pertaining to traumatology and orthopedics. A system previously designed in 1983 was shown to be inefficient because, although it relied on key-word searches in a specialized thesaurus, it failed to take into account the poor state of traumatologic and orthopedic terminology. The present system relies on 12 major rubrics (e.g., bibliographic data, instruments, purpose of invention, operative treatment) and subrubrics, with the classification and analysis performed by clinical specialists in traumatology and orthopedics. In the final analysis, the strength and efficiency of the "Patent" system lies in the fact that coding is performed by knowledgeable clinical specialists. The initial results on patent retrieval indicate that this approach can easily be adapted to other medical specialties.

UDC
615.468.21.015.2:[615.33:577.152.321].036.8:617-001.4-002.3

Immobilization of Lysozyme on Textile Fibers for Use as Dressing for Purulent Wounds

18400373 Moscow ANTIBIOTIKI I KHIMIOTERAPIYA in Russian Vol 33 No 11, Nov 88 (manuscript received 4 Feb 87) pp 848-850

[Article by L. G. Vlasov (dec.), P. I. Tolstykh, T. Ye. Ignatyuk and O. N. Razzakov, All-Union Scientific Research Institute of the Textiles and Clothing Industry, Moscow; First Moscow Medical Institute imeni I. M. Sechenov]

[Abstract] Trials were conducted with the use of dressings bearing immobilized lysozyme to assess the rate of wound healing vis-a-vis regular surgical dressings and free lysozyme. The lysozyme was covalently bound to cellulose dialdehyde and polycaproamide representing, respectively, woven and knitted fabrics. The activity of lysozyme per gram of carrier was 12.7 U/gm for the cellulose dialdehyde preparation and 4.88 U/gm for the polycaproamide, while the specific activities were 33,400 and 69,700 U/gm protein, respectively. Studies on white male rats bearing deep skin wounds infected with *Staphylococcus aureus* 209 showed that in the case of the control rats treated with the free lysozyme, the time for formation of granulation tissue, debridement,

and healing was 5.9 +/- 0.8, 10.0 +/- 1.6, and 24.8 +/- 3.9 days, respectively. For the rats treated with the cellulose dialdehyde dressing bearing immobilized lysozyme, the corresponding temporal parameters were 4.5 +/- 1.0, 7.9 +/- 1.2, and 19.0 +/- 1.3 days; and in the animals treated with the polycaproamide dressing bearing the immobilized enzyme, the corresponding times were 4.2 +/- 0.6, 6.6 +/- 0.8, and 18.0 +/- 1.8 days. The data showed that the nature of the carrier had no significant bearing on wound healing, but that treatment with immobilized lysozyme was much more beneficial than with the free (native) enzyme. References 6 (Russian).

UDC 616.089.843

Transplantation of Donor Liver Involving Connection to Femoral-Subclavian A-V Shunts of Recipient

18400399a Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 132 No 1, Oct 88 (manuscript received 23 Oct 87) pp 177-180

[Article by A. M. Gagua, L. L. Gugushvili, V. P. Demikhov and V. M. Goryaynov, Scientific Research Institute of Experimental and Clinical Surgery imeni K. D. Eristavi, Georgian SSR Ministry of Health; Scientific Research Institute of Emergency Medicine imeni N. V. Sklifosovskiy, RSFSR Ministry of Health]

[Abstract] A method of orthotopic liver transplantation was developed on dogs that is designed to ensure maintenance of full functional capacity by means of a series of vascular shunts to prevent circulatory interruptions. The specific connections included a shunt between the celiac artery of the donor and its aorta and the femoral-subclavian shunt of the recipient, a shunt between the portal vein of the donor and a femoral-jugular shunt of the recipient, an extracorporeal shunt between the subclavian and femoral arteries of the recipient, an extracorporeal veno-venous shunt between the jugular and the femoral veins of the recipient, and a shunt created between the suprarenal inferior vena cava of the donor and recipient. Following relocation of the liver in the recipient bed the biliary duct was introduced into the duodenum. Physiological monitoring showed excellent function over a 3 h monitoring period, including bile production. The key advantages of this approach are simplification of the operative procedures and assurance of a continuous blood supply to the liver. Figures 1; references 13: 1 Georgian, 11 Russian, 1 Western.

UDC 616-073.75

Computerized Tomography in the Interbranch Scientific-Technical Complex 'Mikrokhirurgiya glaza' [Eye Microsurgery]

18402053 Moscow VESTNIK RENTGENOLOGII I RADIOLOGII in Russian No 1, Jan-Feb 89 (manuscript received 2 Aug 88) pp 57-59

[Article by S. N. Fedorov, A. I. Ivashina, S. I. Anisimov, L. N. Prokopenko, and A. L. Moskvichev, Interbranch Scientific-Technical Complex Mikrokhirurgiya glaza]

[Abstract] Computerized tomography (CT) is widely used for diagnosing many eye diseases, as well as for monitoring the effects of instruments (biopsies, injections, etc.) and the effectiveness of medical treatment. There is interest in using CT in the highly specialized Interbranch Scientific-Technical Complex (MNTK) Mikrokhirurgiya glaza [Eye Microsurgery]. In this case, CT was used to examine 1,000 patients—719 for ophthalmological indications and 203 for neurological and neuro-ophthalmological indications. In addition, 78 examinations were made of the abdomen, chest, otolaryngological organs, etc. Examinations were conducted on a fourth-generation KVAD-1 computerized tomograph (USA). In 28 cases, CT was used for differential diagnosis of retrobulbar neoplasm and severe myopic anisotropy. CT was indispensable in diagnosing ophthalmic hemorrhages (17) and detachment of the vascular membrane (11). In these cases, the method allowed the extent of damage to the eye to be determined without any deformation. CT was also used in total dislocation of the crystalline lens (5) and for localizing key parts of implanted corneal prostheses (2), inlays, circular overlays, and other implants (38). CT was especially valuable in that, unlike other instrumental methods, it could be used in cases where a wound was fresh and it would allow the condition of the tissues and adjoining formations of the injured eye to be determined simultaneously. An important area for CT application was control of pathologic and non-pathogenic changes occurring in patients. In 72 cases of glaucoma, with the aid of CT, the degree of hydrocephaly was established concurrently with the determination of pathologic changes in the form of excavation of the optic nerve disk. A specific feature of CT use in the Mikrokhirurgiya glaza MNTK was that the majority of examinations (52%) were associated with pathologies of the eyeball, while 40% were associated with diseases of other parts of the eye. Indications have been extended somewhat for CT for low-pressure glaucoma, complicated severe myopia, and monitoring the position of microsurgical implants. Experience has

shown that CT use in a highly specialized medical establishment such as the MNTK is totally justified. Moreover, diagnostic work without CT does not have a complete or operational character. References 4 (Western).

UDC 616.2-07:616-001.17

Clinical and Morphological Changes in Respiratory Tract Burns

18402067a Kiev VRACHEBNOYE DELO in Russian
No 2, Feb 89 (manuscript received 24 Jun 87) pp 47-50

[Article by S. K. Boyenko, S. A. Danilchenko, M. N. Lysenko and A. V. Fomichev, Chair of Ear, Throat and Nose Diseases, Faculty of Postgraduate Medicine, and Central Scientific Research Laboratory, Donetsk Medical Institute]

[Abstract] An analysis was conducted on the clinical and histopathologic correlates of airway burns in 281 male and female patients, in 174 (50.7%) of whom respiratory insufficiency represented a serious complication. The histological studies, complemented by phase-contrast and polarization microscopy, demonstrated the depth and extent of the pathogenetic mechanisms and confirmed the clinical impression that damage to the respiratory mucosa is comparable to third-degree burns of the skin. Within the first three days the epithelial cover presents with extensive areas of coagulation necrosis, desquamation, edema, and hyperremia. Erosion was supplemented by lymphoplasmatic infiltrates. After about two weeks the basal layer showed evidence of regeneration. In the trachea and bronchi, recovery proceeded at a slower pace than in the upper reaches of the respiratory tract. The entire pathologic process was a key factor in the pathogenesis of pneumonia, a relationship that should be accorded special attention in selecting therapeutic modalities. Figures 3; references 8 (Russian).

UDC 663.1:576.851

Using Solar Energy in Culturing Halobacterium

*Ashkhabad IZVESTIYA AKADEMII NAUK
TURKMENSKOY SSR: SERIYA
BIOLOGICHESKIH NAUK in Russian
No 6, Nov-Dec 88 pp 51-54*

[Article by V. F. Poletayeva, A. K. Korpeyeva, A. Boyarov, and S. Babayev, Solntse Scientific Production Association, TuSSR Academy of Sciences]

[Text] The microbiology sector of industry is an important component of biotechnology that is based on modern achievements in biological science and production. The development strategy of microbiological production is to combine the cellular and technological levels of optimizing processes. It is common knowledge that the microbial cell is a unique machine that is capable of reproducing itself rapidly and precisely under various conditions with a very limited set of substrates.

Microorganisms can grow and function in a wide range of temperatures and in various nutrient medium reactions in high-concentration solutions, under aerobic and anaerobic conditions, by using various organic substances as carbon sources. The diversity of environmental conditions in which microorganisms can exist reflects the broad spectrum of their evolutionary changes.²

Archibacteria, which include halobacteria that only live in saltwater (essentially in steep brine), are one example of the diversity of the existence of microorganisms. Sun-loving bacteria (halophiles) were first isolated and described by the Russian researchers A. A. Berigo (1887) and Ye. M. Boguslavskiy (1890) while they were studying the microflora of drowned river valley mud. The most detailed description of halophiles occurs in two previously published works^{4,7} in which the authors subdivide halophiles into weak halophiles, which require 2 to 5 percent salt to grow and develop and which are found in seawater, moderate halophiles, which require 5 to 20 percent salt, and extreme halophiles, which develop only in a medium of 20 to 30 percent salt.

Extreme halophiles are essentially gram-negative, mobile, pigmented bacilli that do not form spores, may have gas vacuoles, and have a generation time of 7 to 8 hours at 39°C. However, they maintain their viability and mobility when stored under conditions of -20°C for several months.

Saltwater bodies located in regions with a hot climate are the natural nutrient medium form of halophilic bacteria. They are all rose-, red-, or orange-colored because of the presence in the cell of certain carotenoids that the bacterium needs for protection against intense solar radiation, particularly ultraviolet and dark blue. But halophiles do not liberate their dyes into the nutrient medium—the bodies of water get their color from the microorganisms themselves.

The absence of bacteriochlorophyll in the cell is a distinctive feature of halophiles; at the same time, however, they are considered phototrophic. It turns out that their photosynthesis involves bacteriorhodopsin, for which they have acquired the reputation of being a biological phenomenon. Those exceptional properties of bacteria have made them unique biotechnology targets—they are considered sources of ATP, electricity, and molecular hydrogen.

Intensive photobiological and photochemical studies of the halobacteria began only recently, when the unusual function of bacteriorhodopsin, which, structurally close to visual rhodopsin, fulfills the function of a photoenergy converter rather than a photoreceptor, was discovered. The relative simplicity of the energy conversion apparatus in bacteriorhodopsin makes it an exceptional model for studying the principles and mechanisms of bioenergetics for biotechnological purposes.¹

The bioenergetic function of bacteriorhodopsin is directly related to its photochemical transformation cycle. All of this facilitates its use in creating photorecorder systems for various engineering devices.

The *Halobacterium halobium* (strain 353) that we used in our experiments was first isolated from the water of the saltwater Kara-Bogaz-Gol Gulf in the TuSSR by O. Ye. Timuk.³ Further purification of the natural strain and the determination of its properties (including its capability of forming bacteriorhodopsin) were done at the Biological Physics Institute of the USSR Academy of Sciences (Pushchino), where a technology for growing it in an artificial medium with parameters that facilitate the best bacteriorhodopsin formation has been developed.⁵

Thanks to its "phenomenon," the need to produce this substance in large quantities has prompted expanded culturing of halobacteria, but in conditions close to its natural habitat, i.e., using solar energy as the heat and light sources.

For this purpose, in 1986 the Solntse [Sun] Scientific Production Association of the TuSSR Academy of Sciences began work to grow a culture of *H. halobium*, the strain of which was graciously provided by L. N. Chekulayeva (Biophysics Institute, USSR Academy of Sciences).

An analysis of the radiation and temperature conditions showed that the southeastern rays of the TuSSR have environmental and climatic conditions that are the most conducive to growing halophilic microorganisms in glass tube photoreactors using a nontraditional energy source—solar light.

Taking the requirements specifications presented by the Biophysics Institute for their existing laboratory unit as a foundation, we developed requirements specifications for a solar cultivator operating on the very same principle. The cultivator has a light-permeable surface, a device for warming (or cooling) and bubbling the air, a

heat exchanger for reducing adsorption, etc. The light-permeable surface of the unit created at the Solntse Scientific Production Association consists of industrially produced glass tubes that form the basis of the cultivator's tank. The reverse cooler is intended to cool the vapors and return them to the cultivator in the form of drops of medium.

Observations made by L. N. Chukulayeva⁶ established that bacteriorhodopsin formation is sharply reduced in the absence of light. For this reason, to achieve round-the-clock culture growth for maximum formation of bacteriorhodopsin, we used a combined illumination method—i.e., sun during the daytime and artificial light from LG-40 and LD-40 lamps during the night—with which it was established that more bacteriorhodopsin is formed than in the case of illumination from lamps with another spectrum.

The air-heating device (for the winter) is included for year-round operation. It is a regulatable water bath with a copper coil into which heated air is pumped. During the summer, cool air is fed into the cultivator with the same device. The incoming air was purified of dust and oil vapor gas when it passed through water filters and air filters. The quantity of incoming air was controlled by an RM-4 rotameter, the illumination by a luxmeter, the temperature by a built-in thermometer, and the reaction of the medium by a pH-meter. The culture's cell density was measured on a photoelectric colorimeter.

The unit created was placed in an open area to ensure the unimpeded penetration of solar light. The glass tubes were placed in the photoreactor vertically in two rows, which helps the bubbling. The photoreactor's design precludes stagnant zones and provides for the full drainage of the suspension by gravity flow. The mechanical cleaning of the inner surface of the photoreactor's tubes is done with wadding passed through the tubes.

A nutrient medium consisting of an aqueous solution of the necessary salts⁶ was used as the raw material for growing the bacterium *H. halobium*. The seeding material (inoculate) was a 2-day culture grown in a liquid medium in shaker flasks until the cell density equaled 1 dalton.

The prepared nutrient medium, which had been cleansed of mechanical impurities, was poured into the cultivator and was heated to a temperature of 38°C by being blown with heated air, after which the inoculate was introduced. The culture was grown for 3 to 4 days until a cell density of 1.0 to 1.5 daltons was reached. All of the production process parameters were maintained in accordance with regulations. A radiator-type cooling system was switched on during the day when the medium's temperature rose to 41°C.

When the required density was reached, the suspension was drained and centrifuged several times in a flow-through centrifuge until a supernatant density of 0.009 daltons was reached. A cell lysate was prepared from the sediment collected. The lysate was then subjected to

cleaning by numerous washings in a saline solution and in distilled water and was subsequently centrifuged at 6,000 rpm. The pure supernatant was centrifuged on a high-speed centrifuge at 17,000 rpm several times, with the residue being checked for target product based on its absorption spectrum on a spectrophotometer.

The experiments in growing *Halobacterium halobium* that were conducted to produce bacteriorhodopsin on the unit that was created demonstrated the possibility of culturing it by using a combined illumination system.

Using solar light during the daytime cuts the electric energy consumption per unit product obtained in half.

The next stage in this work is to create large-scale units for the mass culturing of halophiles that provide maximum bacteriorhodopsin yields.

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UDC 579.843.95.083.136:546.41

Dry Nutrient Medium for Determination of Cell Composition of Plague Microbe Strains by Calcium-Ion Consumption

18400308a Moscow LABORATORNOYE DELO in Russian No 11, Nov 88 (manuscript received 27 Jul 87) pp 61-62

[Article by Z. I. Vasileva, M. P. Mayevskiy, A. A. Boldina, G. A. Voronova, A. S. Maramovich and M. Ye. Verkhozina, Irkutsk Scientific Research Anti-Plague Institute of Siberia and the Far East]

[Abstract] Virulent strains of the plague microbe require calcium ions during incubation at 37°C. This article reports on the production of an available dry, elective, simple transparent standard medium which preserves the differentiating and growth properties of the Higuchi-Smith medium. An enzymatic hydrolyzate of casein containing 725 mg percent amino nitrogen, 1200 mg percent common nitrogen, 0.4 percent sodium chloride and 4 percent peptone is used, with up to 60 percent splitting of proteins. The optimal version for identifying virulent and avirulent cells contains (in g/l): enzymatic casein hydrolyzate 12.0, glucose 1.5, sodium tartrate 1.0, magnesium chloride 4.0, disubstituted sodium phosphate 7.5, monosubstituted potassium phosphate 2.5, sodium pyrosulfate 0.5, crystalline violet 0.0025, agar 7.0. The nutrient medium allows the virulent and avirulent cells in a population of plague microbes to be determined as a function of their calcium ion consumption. References 6: 4 Russian, 2 Western.

UDC 614.48-078:57.063.138

Assessment of Nutrient Media for Cultivation of Test Microorganisms Used in Monitoring Sterilization Effectiveness of Autoclaves

18400308b Moscow LABORATORNOYE DELO in Russian No 11, Nov 88 (manuscript received 30 Jul 87) pp 63-64

[Article by V. I. Zhuravleva, and Z. F. Bolshedvorskaya, Scientific Research Anti-Plague Institute of Siberia and the Far East, Irkutsk]

[Abstract] The aim of the work reported here was to select a nutrient medium supporting intensive development of heat-resistant spores for cultivation of *B. anthracoides*. Intensity of spore formation was judged based on the rate of accumulation of the maximum number of spores. Heat resistance was studied after two days of cultivation and when identical quantities of spores were accumulated in each medium. Culture specimens were placed in a boiling water bath for 5-30 minutes. After subsequent growth for 18-20 hours at 37°C, the number of colonies was determined. The greatest number of spores was accumulated upon cultivation on peptone agar, after 48 hours; a slightly smaller number of spores were produced with Hottinger's agar, after 12-15 days.

Spores grown on beef-peptone agar were most sensitive to heat. Results were tested under production conditions, confirming the correctness of the conclusions. References 7 (Russian).

UDC 616-002.828

Immunochemical Analysis of Coccidioides Fungus Antigens

18400309a Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 22 No 5, Sep-Oct 88 (manuscript received 4 May 87) pp 441-446

[Article by N. P. Khrapova, N. M. Rogozhkina, S. F. Zharkova and I. V. Novitskaya, Volgograd Scientific Research Anti-Plague Institute]

[Abstract] The qualitative and quantitative characteristics of cellular and noncellular *C. immitis* antigens depend on the method of their production, fungus growth phase, cultivation conditions of pathogen and resolution of methods used to study the preparations and identify their components. This article determines the effectiveness of the use of immunoelectrophoresis for identification of the group- and species-specific antigens in the mycelial phase of growth of the coccidioides fungus. The immunochemical analysis of antigen preparations described seven precipitinogens of the coccidioides fungus. The *C. immitis* antigen spectrum was determined for the first time. Figure 1, references 34: 7 Russian, 27 Western.

UDC 616-002.828

Spontaneous Morphologic Variants of Coccidioides Immitis Rixford Et Gilchrist, Differing in In Vitro Convertibility

18400309b Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 22 No 5, Sep-Oct 88 (manuscript received 31 Oct 86) pp 446-450

[Article by A. I. Shelokhovich, V. S. Lesovoy, A. V. Lipnitskiy and Ye. I. Prokofyeva, Volgograd Scientific Research Anti-Plague Institute]

[Abstract] The purpose of this work was to identify and describe morphologic variants of *C. immitis* differing in in vitro convertibility. Arthrospores of the fungus were obtained by washing of a mycelial culture grown for 1.5 months at 28°C on a Sabouraud agar medium (SDA) with 1.5 percent yeast autolysate. Morphological variants were identified with a number of other media. Cultivation was performed in an ordinary thermostat and in a thermostat with automatic carbon dioxide concentration regulation. Observations of conversion and growth of fungus colonies were performed under an MBS-1 microscope with a modified illumination system. Preparations were examined with a phase-contrast dark-field device. It was found that the cells of morphologic

variants which differ in their in vitro convertibility are apparently identically converted from the mycelial phase to the spherule phase under conditions *in vivo*. However, in retrocultures grown by the two-stage method, the different versions retained their different convertibilities. The complex of characteristics distinguishing the morphologic variants thus include characteristics which appear under conditions favoring spherule formation as well as characteristics inherent in the mycelial phase. References 19: 6 Russian, 13 Western.

UDC 615.919.579.843.1].076.9

Gnotobiotic Animals in Studies on Pathogenesis of Cholera Intoxication

18400369a Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLLOGII in Russian No 12, Dec 88 (manuscript received 13 Dec 87) pp 44-48

[Article by I. V. Isupov, G. I. Podoprigora, V. A. Dushkin, A. V. Gorkova, L. S. Nazarova, L. P. Pavlova, M. M. Intizarov, T. I. Zaytsev, A. K. Baltrashevich, L. A. Bolotskikh and T. P. Komarovskaya, All-Union Anti-plague Scientific Research Institute "Mikrob," Saratov; Scientific Research Laboratory of Experimental Biological Models, USSR Academy of Medical Sciences, Moscow]

[Abstract] The pathogenesis of cholera intoxication was evaluated on germ-free suckling rabbits (3-10 days old) and miniature piglets (7-14 days old). The data were compared with conventionally maintained suckling rabbits and piglets. The cholera toxin and O-antigen were introduced per os, with determinations of survival figures, histochemical information and histopathologic findings demonstrating that the germ-free animals were far more susceptible than the control animals bearing normal intestinal flora. Per os introduction of *Bacteroides* sp., particularly in combination with *E. coli*, to the germ-free animals were shown to enhance the toxicity of the toxin and increase mortality. However, administration of lactobacteria either in isolation or in combination with the *Bacteroides* diminished the susceptibility of the germ-free animals to the cholera toxin. These observations demonstrate the utility of germ-free animals in studies on cholera, but also the fact that the endogenous microflora of conventionally raised animals also affects the outcome of studies on cholera. References 16: 14 Russian, 2 Western.

UDC 579.841.11.07

Stability of *Pseudomonas Aeruginosa DC13* Biodegradation of Alpha-Methylstyrene in Industrial Waste Waters

18400378b Moscow MIKROBIOLOGIYA in Russian Vol 57 No 6, Nov-Dec 88 (manuscript received 29 Feb 88) pp 1044-1045

[Article by L. A. Golovleva, R. M. Aliyeva and S. A. Rustemov, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Moscow]

[Abstract] The ability of *Pseudomonas aeruginosa DC13* to degrade alpha-methylstyrene, which is attributable to the genetic potential of a 130 MDa plasmid (pBS253), led to an assessment of the stability of that relationship during prolonged treatment of industrial waste waters. The data showed that after 4 months of constant use 79 percent of the fiberglass-immobilized bacterial population retained full capacity for biodegradation of alpha-methylstyrene. A further 17 percent of the population lost the genetic determinants responsible for the biodegradation of alpha-methylstyrene (and biphenyls), while 4 percent of the population completely lost the phenotypic characteristics of the original strain. The high degree of genetic stability and retention of the plasmid was attributed to the selective pressure exerted by the primary substrate alpha-methylstyrene. These observations, furthermore, provide additional support for the use of plasmid-bearing bacterial strains for biological removal of xenobiotics from waste waters. Figures 1; references 3: 2 Russian, 1 Western.

UDC 579.852.11.246.4

Anthrax Bacillus Sporogenesis in Model Soil Conditions

18400380a Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 50 No 6, Nov-Dec 88 (manuscript received 18 Dec 87) pp 31-36

[Article by V. P. Volkova, O. M. Verner and K. M. Sinyak, Kiev Institute of Advanced Training of Physicians]

[Abstract] An analysis was conducted on soil factors favoring sporogenesis in *Bacillus anthracis*, employing orchard-garden soil samples with pH 7.4-7.6 and grey forest soil with pH 4.3-6.4, and a temperature range from -2°C to +37°C. The results showed that maximum sporogenesis was evident in the pH range of 6.4 to 7.6, with a temperature optimum of 37°C. In addition, while positive temperatures were required for high levels of sporulation, preservation of soil samples at -2 to -5°C for 45 days yielded 100 percent sporogenesis under subsequent optimum conditions. Preservation at 10°C for an equivalent period of time reduced the rate of sporogenesis to about 80 percent. Figures 3; references 15: 13 Russian, 2 Western.

UDC 582.282.123:620.193.8

Adhesion of Microscopic Fungi to Hydrophobic and Hydrophilic Surfaces

18400380b Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 50 No 6, Nov-Dec 88 (manuscript received 1 Jul 87) pp 68-70

[Article by I. V. Kaznacheyev, K. Z. Gumargaliyeva, S. N. Mironova and Yu. V. Moiseyev, Institute of Chemical Physics, USSR Academy of Sciences, Moscow;

Institute of Microbiology, Belorussian SSR Academy of Sciences, Minsk]

[Abstract] An analysis was conducted on the adhesiveness of *Aspergillus niger*, *Asp. terreus*, *Penicillium chrysogenum*, *P. cyclopium*, and *Paecilomyces varioti* to a hydrophobic (polyethylene) and a hydrophilic (cellophane) surface to determine the predominant factor responsible for this effect. Evaluation of the data on contact angles, radius of conidia, rate constants (K) for the formation of adhesive forces, and adhesion limit number demonstrated that the key factor in adhesion to hydrophobic and hydrophilic surfaces was the radius of the conidia. An inverse relationship prevailed between the radius of the conidia and K. Consequently, with small diameter conidia the nature of the surface is relatively immaterial and the K and limit number are identical for hydrophobic and hydrophilic surfaces (e.g., *A. terreus*; 1 μ radius). As conidial diameter increases, surface effects become more pronounced and the K and limit number differ for hydrophobic and hydrophilic surfaces (e.g., *A. niger*; 5 μ radius). However, there was no correlation between K and the limit number, nor between K and the contact angle. Figures 4; references 6: 5 Russian, 1 Western.

UDC 615.331:632.937:636.085

Study of Effect of *Bacillus Thuringiensis* Serotype H-14 Preparations on Mammals

18400380c Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 50 No 6, Nov-Dec 88 (manuscript received 12 Nov 87) pp 73-77

[Article by V. I. Ignatyev, E. G. Karpov and V. Sh. Meliksetyan, All-Union Scientific Research Institute of Veterinary Entomology and Arachnology, Tyumen]

[Abstract] In order to further define the safety margins of *Bacillus thuringiensis* var. *israelensis* serotype H-14, extensive toxicity testing was conducted with two species of this bacterium on white mice, rats, and rabbits. In addition, testing was also conducted with the commercially available larvicide BLP-2477 derived from *B. thuringiensis*. Comprehensive assessment by various routes of administration and exposure showed massive doses of the *B. thuringiensis* biomass to have no adverse health effects either on the animals directly or in terms of postnatal development. In addition, BLP-2477 was found to be equally innocuous as far as the mammalian organism was concerned. References 6: 4 Russian, 2 Western.

UDC 613.67:614.895.5:612.745.1:612.55

Means of Preserving Efficiency of Individuals Wearing Protective Gear

18400340 Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russia No 5, May 88 pp 45-47

[Article by Yu. G. Pletenskiy, candidate of medical sciences, P. B. Markelov, A. Yu. Nefedov, candidate of medical sciences, and M. I. Kharchenko, candidate of medical sciences, under the rubric "Military Industrial Hygiene and Physiology"]

[Text] When insulated, filtering, impregnated suits and other personal protective gear (PPG) are being worn in a particularly hot microclimate that requires comfort control, work hours must often be increased and the individual's efficiency kept at a rather high level against a background of hyperthermia.

The insulating, ventilated PPG (pneumatic suits, pneumatic jackets) that are worn as protection against radioactive and toxic chemicals, for example, have good protective properties, but are ineffective in maintaining the heat balance of workers, mainly because of the unregulated temperature of the air delivered to the protective gear (S. M. Gorodinskiy, 1979; M. I. Kharchenko, 1980). Additional passive or "active-passive" thermal insulation is used in order to attenuate hyperthermia when working in ventilated PPG (Ye. M. Zuyeva, V. V. Selivanov, 1980), and the delivered air is distributed more efficiently (S. M. Alekseyev, S. P. Umanskiy, 1973) and the additional cotton coveralls doused periodically with water (S. M. Gorodinskiy, 1979).

Air-conditioners, i.e., rotating air coolers, have been developed to improve the temperature-regulating efficiency of ventilated PPG (P. B. Raven et al., 1979). Self-contained PPG represents a new direction of development of personnel gear (A. N. Molodtsov et al., 1980). However, regardless of their operational advantages, the cooling capacity of self-contained sources of air supply depends even more on the temperature and humidity of ambient air.

The temperature-regulating effect of the ventilated system of pneumatic suits can be improved by delivering dry, cooled air (input temperature 20°C) to the parts of the body (back, waist) that perspire the most (S. M. Gorodinskiy, G. V. Bavro, 1971). For this purpose, at our suggestion a ventilation device was developed in the form of a vest, the supporting base of which is made of elastic mesh. Panels are installed in it that are connected to the collector via polyvinyl chloride tubes. Sixty percent of the air is distributed through the panels to the trunk, and 40% to the head region. That resulted in a 40 percent increase (to 220 min from 130) in the duration of maintenance of permissible temperatures when moderately heavy work is being performed at an ambient temperature of 50°C.

With an eye to achieving maintenance of the fluid balance during hyperthermia, a study was made of the effect on body temperature of artificial moistening of the skin with water. Experiments were performed with a pneumatic suit combined with ventilation vest and humidifying system. Water was delivered at the rate of 3.2 ml/min, and it moistened the ventilation panels. The studies were conducted using constant ventilation parameters (delivery 0.6 m³/min, air temperature at input of pneumatic suit 20°C, relative humidity 10-20 percent) and a temperature in microclimate chamber of 50°C while physical work was being performed requiring energy expenditure of 310-350 W for 4 h. With use of additional moistening of the surface of the body and the ventilation vest (15 experiments), weighted mean skin temperature of the subjects constituted 32.2 plus or minus 0.10°C, heat content was 124.7 plus or minus 0.11 kJ/kg, and fluid loss constituted 360 plus or minus 10 g/h. In the control (pneumatic suit without air distribution, 9 experiments), those parameters constituted 35.9 plus or minus 0.25°C, 127.7 plus or minus 0.25 kJ/kg and 530 plus or minus 15 g/h, respectively.

The body's excess heat while working in PPG can be removed primarily by the conductive method—with a so-called liquid suit. Such a suit consists of a system of tubes (heat exchangers) made of polyvinyl chloride that contact the skin (stitched to the inside of coveralls made of absorbent material); a coolant—consisting of water and aqueous solution of ethyl alcohol—circulates through the tubes. Of greatest practical interest is the "local" liquid conductive-cooling suit (LCC), the heat exchangers of which cover 50% of the body (N. G. Lando, 1970; A. Yu. Nefedov, 1980). The efficacy of an LCC depends on the temperature-effect conditions, which must be established on the basis of the amount of area and the localization of the body surface being cooled.

In order to investigate this matter, 117 experiments were conducted in a microclimate chamber on 6 male subjects 20-30 years of age. Wearing humidified thermal-insulation coveralls with 2.5 clo insulation, the subject performed moderate physical labor (energy expenditure 230-290 W) for 4 h in a regime that specified 40 min work followed by 20 min rest. Coolant (heat capacity 0.9 k cal/kg X degree) was delivered at temperatures of 5 to 30°C at the rate of 100 kg/h into the LCC (heat-exchange elements placed on the trunk, tube length 70 m, distance between parallel tubes 1 cm).

As shown by the studies, stabilization of rectal temperature and "warmth" sensation were observed at coolant temperature of 27-28°C; whereas a temperature of 30°C caused continuous accumulation of heat in the body. For this reason, one can take 27°C as the top of the range of permissible temperatures for the coolant at the LCC input when moderately heavy work is being performed in heat-insulation gear. When the coolant temperature is dropped from 30°C, the temperature becomes comfortable at 15°C. In spite of the fact that, under the above conditions, the temperature of the hands and feet still

rose to 35.5°C, there was virtually no sensation of overheating of the extremities as a result of the drop in weighted mean skin temperature in the cooled regions to 26.2-26.8°C and the drop in temperature of some areas to 24.0°C.

Those features of heat distribution in the body and stabilization of rectal temperature near the bottom range of optimum values with a coolant temperature of 15°C enable us to take 15°C as the lower boundary of the range of optimum temperatures. The upper boundary is about 20°C, the point at which the temperature is distinctly uncomfortable in the distal parts of the arms and legs. For that reason, 15-19°C can be recommended as the optimum temperature for coolant at the LCC input. When 5°C coolant was delivered, there were signs of overcooling of the body. Based on that, 10°C is recommended as the lower boundary of the range of permissible coolant temperatures.

In cases in which use of artificial temperature regulation in PPG is impossible, virtually the only means of preventing heat exhaustion is to limit work time. Efficiency can be maintained over a period of 4-6 h of moderately heavy work without replacement of fluids only by maintaining the permissible (heat-stable) thermal state of the body (S. M. Gorodinskiy et al., 1973).

Maximum levels of stabilization of rectal temperature, heat content and weighted mean skin temperature characterize the upper boundary of the permissible thermal state of the body; regardless of intensity and mode of work, those parameters vary over a rather narrow range and do not exceed 38.0°C, 130 kJ/kg and 35.5-36°C, respectively (D. V. Makukhin et al., 1982). If those parameters are elevated during the first hour of work, there is further continuous accumulation of heat in the body. That fact has demonstrated the possibility of predicting duration of work under hyperthermic conditions (L. M. Rimskaya, 1980). Maximum level of stabilization of heart rate in a hot microclimate varies as a function of intensity of work performed: during light work, it is 120/min, moderate work 130/min and heavy labor 140/min (D. V. Makukhin et al., 1982). The work regime has virtually no effect on this level.

Based on the above criteria, the upper boundary of the permissible range associated with a hot microclimate has been determined for various intensities and durations of work in PPG. The permissible duration of work has been determined for specified microclimatic parameters of the environment and the in-suit space. The results of this standard-setting are reflected in the "Physiological and Hygienic Specifications for Insulated Personal Protective Gear" (1981).

A high degree of efficiency is maintained by adopting a wise work-and-rest schedule. The specifics of working while wearing PPG requires consideration not only of general guidelines of the approach (V. I. Medvedev et al., 1984) in the study of optimum work modes, but also development of a special methodology, because of the

effects on the body of a set of additional adverse factors (load on skeletomuscular system and on the circulatory and respiratory systems), difficulties associated with heat exchange with the environment, etc.

When ambient temperature is high, it is more expedient to regulate the work-and-rest schedule primarily on the basis of indicators of the thermal state of the body and, to some extent, work efficiency indicators (V. S. Viktorov, 1977; D. V. Makukhin et al., 1982). According to V. S. Viktorov (1977), the duration of the rest period during every hour of working time should constitute 14 and 20 percent per hour of work time for moderately heavy work at temperatures of 25°C and 35°C, respectively; the duration of rest should constitute 20, 27 and 40 percent for heavy work at temperatures of 15°C, 25°C and 35°C, respectively.

One of the means of extending work time in PPG is to increase the heat resistance of the body by means of systematically conditioning the body to withstand hyperthermia (C. H. Wyndham, 1965; O. G. Edholm et al., 1977). Most researchers believe that the heat-conditioning should be done daily to achieve a beneficial effect. This involves exercise (step test, treadmill, cycle ergometer) at 40-50 percent of maximum oxygen consumption at ambient temperatures of 40-50°C, and sometimes even 60°C, with relative humidity of 20-40 percent. As yet there are no standardized recommendations on total duration of heat-conditioning. Some feel that it should last 7 days (R. Francesconi et al., 1977); others, 10 days (G. N. Novozhilov, 1981; D. Mitchell et al., 1976); others, as much as 14 days (J. B. Westin, 1976).

At the same time, the question of duration of the effect of artificial acclimation has been studied very little. It can only be assumed that it persists for no more than 2-3 weeks after discontinuing heat-conditioning. This circumstance, along with the cumbersome program of conditioning and need for special equipment (heat chambers, exercise equipment, instruments to monitor body temperature) and continuous monitoring by medical personnel make it impossible to use this method on a broad scale.

In recent times, researchers have become markedly more interested in questions of pharmacological correction of work efficiency and fatigue, especially in the performance of physical labor and operator work under complex conditions (hyperthermia, hypoxia, etc.). The data accumulated in the literature concerning the effects on human work efficiency of psychoanaleptics, psychoenergizing agents, actoprotective agents and energy-producing compounds, vitamins and adaptogens, etc. (G. N. Novozhilov, 1981; Yu. G. Bobkov et al., 1984; V. S. Shashkov, N. G. Lakota, 1984) make it possible to assume that, in terms of heat exposure, the group of actoprotective agents (derivatives of 2-mercaptopbenzimidazole) is quite promising for investigation. However, pharmacological agents are not widely used in conditions accompanied by hyperthermia.

Thus, the most effective means of maintaining the efficiency of an individual wearing PPG in a particularly hot microclimate that requires comfort control is to maintain the body's temperature homeostasis with systems of artificial temperature regulation. However, the fact that such systems are not self-contained when the individual is working on the ground [as opposed to space or water] limits the range of their potential use. The most accessible method of preserving work efficiency in PPG is to prevent hyperthermia by regulating duration and regime of work. However, validation of the optimum regimes of heat conditioning and the search for pharmacological agents that can effectively correct work efficiency and heat resistance require further investigations.

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Important Contribution to Field Surgery

18400343 Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 9, Sep 88 p 17

[Article by I. A. Yeryukhin, Professor, Major General, Medical Service; "Important Contribution to Field Surgery"]

[Text] The Medical Service of the armed forces of the Republic of Afghanistan is using a unique experiment in treating combat injuries. At present, the medical protection system is generally meeting the demands upon it satisfactorily. The system's basic link is the Central Military Hospital, where Soviet and Afghan physicians collaborate. The 10th anniversary of the Central Military Hospital of the Republic of Afghanistan Ministry of Defense was commemorated by the first thematic scientific conference, the materials of which were published in a collection of reviews¹.

1. "Mine Explosion Trauma. Wound Infection." Edited by M. Mussa and A. I. Gritsanov. Kabul, 1987. (Materials of a Scientific Conference, Dedicated to the 10th Anniversary of the Founding of the Central Military Hospital MO RA).

The theme of the conference is extremely important for the military health care of the country. There has been a steady increase in the percentage of mine explosion injuries in the medical loss structure in recent years. The difficulties encountered in treating such wounds are well known, and problems of pathogenesis have not been systematically studied previously. The specific conditions of the region and objective difficulties of the situation cause a large percentage of wound infection complications. This explains the selection of the second problem on the agenda of the jubilee conference. The conference materials consist of two sections, "Wound Infection" and "Explosion Trauma".

The originality of the data presented and the high scientific-methodological level of the studies presented attract one's attention. We do not have analogous publications that discuss, from present-day positions, problems of organization and practice of surgical assistance to troops during local combat actions. The basic methodological principle of the reports is the complexity of the studies—participation of physicians of different specialties in the development of each of the scientific schools of thought presented.

The section "Wound Infection" includes some studies dealing with the treatment of purulent complications after combat injuries and their prognosis and prevention. These articles present, in succession, factual material concerning surgical tactics in the treatment of gunshot wounds of the thorax, acute pleural empyemas, and peritonitis of gunshot origin and material on the prevention and treatment of tetanus, gas-forming wound infection, and sepsis from gunshot and mine-explosion wounds.

Data concerning the practical use of different therapeutic factors and methods in the treatment of wound peritonitis are especially valuable. This applies, first of all, to intestinal decompression with the use of a probe, peritoneal perfusion, and different methods of draining the peritoneal cavity and the retroperitoneal space. The attempt of some of the authors to work out methods of an objective approach to determining periods of the pathological process in wounds is appropriate and deserving of support, especially since some of the methods proposed (especially determination of the stage of wound peritonitis) do not require special equipment and may be used in field surgery.

A large part of the conference material concerns mine explosion injuries. Complex studies and clinical experiments of treatment of a specific kind of combat pathology, performed at the present-day level, made it possible to develop basic trends of this important problem—problems of pathogenesis, classification, prevention of complications, complex pathogenetic therapy, and organizational principles of providing assistance at stages of medical evacuation.

A complex approach to the determination of surgical tactics in treating mine fractures of distal segments of the

extremities was developed by joint efforts of surgeons, traumatic surgeons, pathomorphologists, and radiologists. Pathogenetic principles of the use of hyperbaric oxygenation in the treatment of mine explosion injuries were developed; the effectiveness of this method in preventing infectious wound complications was shown convincingly.

It is not necessary to analyze each of the works in the collection. They all are sufficiently argumentative and replete with practical factual material. The participation of the Soviet medical consulting specialists of TsVG in the scientific development of the problems indicated is still another sign of our benevolent international assistance to the Afghan people in the establishment of its medical science. ©"Voyenno-meditsinskiy zhurnal", 1988

UDC 613.6:626.02(4-17)

Medical Support of Diving Operations in Far North With Use of Drifting Iceberg

18400346 Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 10, Oct 88 pp 56-57

[Article by V. G. Zhukov, professor, Colonel, Medical Service, Yu. P. Doroshenko, candidate of medical sciences, Colonel, Medical Service, S. N. Borisenko, Captain, Medical Service]

[Text] An experiment in organizing a diver post on a drifting iceberg as a natural platform was performed in the course of different kinds of underwater search operations carried out on large areas in high latitudes in spring. It was impossible to bring ships into the search area because of the severe ice conditions. The operations were carried out on a low, stable 25- to 30-m² iceberg without cables after preliminary study of the underwater part by a diver. The rate of natural drift was 1.5 km/hr. An Ob-M motorboat with a Virkh engine landed the personnel and equipment on the iceberg.

The diving post was deployed according to the rules of the diving service for performing diving operations from an iceberg. Descents were made in autonomous equipment with a closed cycle of breathing. Deployment of the post took no more than 15-20 minutes.

A special diving first-aid set, DP-2 artificial respiration apparatus, and a thermos containing hot coffee were used by the physician-physiologist when giving medical assistance. In addition to this, the diving post had a radio station and signal rockets, which ensured continuous communication with the shore. A portable recompression station with breathing apparatus and a diving first-aid set stood in constant readiness on the shore. Casualties could be brought to the recompression chamber in less than 1 hour. An Ob-M motorboat and a floating caterpillar-tractor towing vehicle equipped with a radio station were used to evacuate casualties. On the towing vehicle, which was located on the ice edge of the shore and was ready to go into the water if necessary,

were medical stretchers and a KI-4 oxygen inhalator, and heated cubicles were used to disrobe and warm the divers.

The experiment showed some advantages to conducting search operations by using an iceberg as a natural platform. The large area and the steadiness of the iceberg greatly facilitate dressing (undressing), switching on the apparatus, descent (ascent) of the diver, rendering medical assistance, and an increase in the range of movement of the insurance diver, which is very important in preventing overcooling of the swimmer. The motor capacity of the motorboat is saved, and the danger of tangling the signal end on the screw is avoided. We must point out that the speed of the drifting iceberg is uniform and less than the minimum speed of the motor boat, which reduces the probability of the rise of barotrauma of the lungs during ejection of the diver to the surface.

At the same time, there were bad features of the procedure. First of all was the impossibility of towing the natural platform from an injured diver. It is true that this was compensated, to some degree, by the use of the motorboat. The situation was unusual inasmuch as the diving post did not have direct communication with the shore; there was no place for undressing and warming the divers. In view of this, the medical service had to work out a special tactic for medical support of the diving operations. The essence of the tactic included the following.

When planning medical support, the physician-physiologist should proceed from a careful analysis of the developing conditions, an objective consideration of the capabilities of the medical service, and proper prediction of probable changes in the situation. They must give attention to climatic, meteorological, and geographical features of regions of the Far North. These include the prolonged effect of the moist cold air on a person, abrupt drops in air and water temperature, prolonged strong winds, low level of ultraviolet irradiation, high energy expenditures against a background of an aesthetic syndrome in the polar night, and others.

The plan must include measures for preventing illnesses connected with supercooling of the underwater swimmers: systematic hardening of the personnel, timely supply of warm clothing, provisions for its regular

drying, and timely repair of the divers' linen and footwear. Explanation of problems of the hygiene of dives and rendering of medical assistance, etc., are quite important.

There must be provided a very hot, high-calorie, vitaminized meal 2 hours before the beginning of work and in the period between dives. There must be a thermos containing sweetened tea, coffee, or hot milk on the diving post. A warm place for undressing and warming the divers after dives should be provided in the immediate vicinity of the dives. The insurance divers should be equipped with padded trousers and large felt boots so that they can easily get on hydro-overalls. There must be a diving face mask with a slit for the eyes and mouth in order to protect the face from the cold during a long stay in the air. In spring, personnel must have special eye "protectors" to prevent eye injuries from reflected sunlight. Attention must be given to rules of behavior when encountering aggressive marine animals. ©"Voyenno-meditsinskiy zhurnal", 1988

Eliminating Complications From Gunshot Wounds of the Extremities

18402092 Moscow MEDITINSKAYA GAZETA in Russian 24 May 89 p 3

[Article by A. Teplov, major, Medical Corps, staff physician, Department of Traumatology, GVKG [expansion unknown] imeni N. N. Burdenko]

[Abstract] Gunshot wounds of the extremities, as seen in many veterans of Afghanistan, often require years of therapy and a commitment on the part of the patient, and frequently fail to yield satisfactory results. In the final analysis the affected limb is often shorter and presents with various degrees of functional impairment. Defect in the long tubular bones pose a special challenge. One of the most effective approaches to the treatment of such conditions involves the techniques developed by Ilizarov, consisting of bilocal compressive-distraction osteosynthesis. This technique has been used successfully to treat defects ranging from 5 to 18 cm, involving from two to ten surgical interventions per patient. The Burdenko military hospital has been having considerable success since 1980 in using endoprostheses in the management of joint injuries and rehabilitation. More recently extensive use has been made of adjunct therapy in the form of hyperbaric oxygenation, magnetotherapy, and perioperative irradiation to minimize pyogenic complications.

UDC 576.52:578.831.9:577.112

Surface Glycoproteins of Sendai Virus and Their Use for Cell Fusion

18400360A Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 5 No 12, Dec 88 (manuscript received 31 May 88) pp 1281-1288

[Article by V. P. Kopyev, L. S. Zhigis, V. A. Slepushkin, P. D. Reshetov, L. I. Fedorova, V. M. Borodina, and A. V. Zelenin, Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, Moscow; Institute of Molecular Biology, USSR Academy of Sciences, Moscow]

[Abstract] Interest in the Sendai virus has recently increased due to its use in the fusion of fractions of its surface glycoproteins. This article studies the possibility of using isolated and purified Sendai virus proteins as standard fusogens for fusion of animal cells in culture. Two proteins have been isolated (HN and F) that are responsible for cell fusion. A mixture of F and HN is found to be highly effective in fusion. Analysis of cell morphology showed that 15-30 minutes after adding the mixture of glycoproteins the contours of the cell wall become less smooth, there is an increase in penetration of dye into the cell, and cells begin to agglutinate and form close contacts. The use of the purified proteins as fusing agents avoids a number of difficulties inherent in the common method of fusion with inactivated virus. Figures 4; References 17: 3 Russian, 14 Western.

UDC 578.52

Structural Features of Integration Site for Foreign DNA in Genome of Transgenic Mice

18400363a Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 22 No 6, Nov-Dec 88 (manuscript received 30 Dec 87) pp 1553-1561

[Article by I. V. Makarova, V. Z. Tarantul and K. G. Gazaryan, Institute of Molecular Genetics, USSR Academy of Sciences, Moscow]

[Abstract] A detailed analysis was conducted on the features of regions adjacent to the integration site for a segment of foreign DNA in transgenic mice, with the transgene represented by a fragment of the plasmid pBR322. One of the flanking sequences 60 bp from the site of integration contained short, overlapping direct and inverted repeats. The same flanking sequence accommodated, at a distance of 0.3 to 1 kbp from the transgene, extended, highly conservative sequences of about 3.5 kbp that are repeated 100 to 300 times in the murine genome. These newly described sequences have received the designation T1 and have also been observed in the genomes of other mammals, as well as in fish, birds, and in insects. It is believed that both the short repeats, which are capable of forming hairpin turns and loops,

and the T1 repeats are functionally involved in nonhomologous integration of exogenous DNA into the genomic DNA. Figures 5; references 35: 6 Russian, 29 Western.

UDC 579.252.58:577.214.625:577.113.5

Control of Gene Expression for Secretory Proteins in Bacillus Subtilis by Phage Lambda Promoters

18400363b Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 22 No 6, Nov-Dec 88 (manuscript received 17 Nov 87) pp 1658-1666

[Article by A. V. Sorokin, R. Brayling (Breitling)* and D. Benke (Behnke)*, All-Union Scientific Research Institute of Genetics and Breeding of Industrial Microorganisms, Moscow; *Central Institute of Microbiology and Experimental Therapy, Jena, GDR]

[Abstract] A study was conducted on the efficiency of phage lambda promoters (P_R and P_L) in controlling expression of staphylokinase and alpha-amylase genes in *Bacillus subtilis*. The efficiency of these promoters was determined by comparison of the level of synthesis of these proteins obtained with P_R and with P_L with the level obtained by the use of the alpha-amylase promoter (P_{AA}) of *Bacillus amyloliquefaciens*. In terms of efficiency the promoters were ranked as follows in *B. subtilis*: P_{AA} is greater than P_R is greater than P_L . (The level of synthesis of alpha-amylase obtained with P_R was 50 percent of that seen with P_{AA} , and that obtained with P_L even less.) In addition, the absence of repression of P_R at 30°C in *B. subtilis*, unlike the case of *E. coli*, indicated that the CI857 repressor was not formed. The P_R promoter was found to be used by *B. subtilis* at a later stage of growth than the P_{AA} promoter, and P_L was used still later. On balance, these findings demonstrated that P_R is much more promising in bacilli than P_L for gene expression. Figures 6; references 22: 3 Russian, 19 Western.

UDC 575.224.4:577.213.3

Mutagenesis Directed by Phosphotriester Analogues of Oligonucleotides: Path to Site-Specific Mutagenesis *in vivo*

18400547d Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 3, Mar 89 (manuscript received 27 Apr 88) pp 35-39

[Article by V. A. Petrenko, S. M. Kipriyanov, A. N. Boldyrev, and P. I. Pozdnyakov; All-Union Scientific Research Institute of Molecular Biology, Ministry of the Medical and Biological Industry, Koltsovo, Novosibirsk Oblast]

[Abstract] In this work, the feasibility of inducing directed mutations *in vivo* with high effectiveness by means of treating bacterial cells with a mixture of DNA and phosphotriester analogues of oligonucleotides,

which play the role of mutagenic triggers and are protected from nuclease activity, was shown for the first time. Phosphotriester oligonucleotide analogues induced the deletion of the first or second nucleotide of the seventh codon in gene Z' of M13mpB phage DNA, leading to the formation of the Lac^r deletion mutant M13mp1ΔT, which differed by phenotype. Competent *E. coli* JM103 cells were transformed by complexes of oligonucleotides with M13mpB phage DNA. Data obtained in experiments with 20-membered oligomers (20-mers) showed that the introduction of one or two phosphotriester bonds, which protected the introduced mutation from the 5'-end, caused the yield of mutants to increase 1.5- to 2-fold. With the use of oligonucleotide derivatives containing 2 or 3 phosphotriester groups

near the 3'- and 5'-ends of the molecule, the effectiveness of mutagenesis significantly increased. The effectiveness of mutagenesis *in vivo* depended on the concentration of the oligomer-DNA complex in physiological conditions. The maximum yield of mutants was achieved when the DNA matrix was "saturated" with oligomer. For the majority of variants observed, mutation was determined by the structure of the oligonucleotides (deletion of C). Only in the case of the 17-Et₂-1 analogue were mutants obtained containing an unplanned deletion 262 nucleotides long, including the end of the lacI gene (which codes the lac-receptor) and the regulator and part of the structural region of the lacZ' gene. Figures 3; references 14: 7 Russian, 7 Western.

Relationship of Immune System Response and Number of Exposures of Thymus to Decimeter Waves

18400313b Frunze ZDRAVOKHRANENIYE KIRGIZII in Russian No 6, Nov-Dec 88 pp 26-29

[Article by V. M. Yevstropov, Kirgizii Scientific Research Institute of Health Resort Science and Physical Therapy]

[Abstract] One-time whole-body exposure to microwaves at 2450 MHz increases the content of complement-receptor cells in the spleen, and three-time exposure also causes an additional increase in Ig-positive cells. Studies were performed on 180 mature guinea pigs, which were exposed to decimeter waves from a Romashko device operating with a power flux density of 80 mW/cm² either once for 10 minutes (group 1) or once daily for five days (group 2). Blood studies in group 1 were performed one hour after exposure and 1, 2, 3 and 4 weeks after exposure; blood studies in group 2 were performed on the same schedule, except that they followed the fifth exposure session. The dynamics of thymus indicators following one-time exposure, unlike those of the five-session exposure regime, showed several phases, with an initial increase in the number of rosette-forming thymocytes, then an increase in the number of active thymocytes and a greater increase in the number of active T-cells of the thymus.

UDC 577.391.575.24.538.56

Do Powerful Electromagnetic Fields in Decimeter Band Affect Microbial Genetics?

18400332e Moscow RADIOPHYSIOLOGIYA in Russian Vol 28 No 5, Sep-Oct 88 (manuscript received 3 Feb 88) pp 707-713

[Article by V. I. Panasenko, Institute of Plant and Microbial Biochemistry and Physiology, USSR Academy of Sciences, Saratov]

[Abstract] Studies were conducted with *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhimurium*, *Candida tropicalis*, and *B. Thuringiensis* to assess the possible genetic effects of exposure to powerful electromagnetic fields in the decimeter band (40-100 W/cm³, 2375 MHz). The data showed that Mutagenesis was generally directly related to the duration of exposure and the attendant thermal effects, and corresponded to peak death figures. The resultant phenotypic changes encompassed colonial morphology and biochemical characteristics of the various test genera. In addition, the studies revealed considerable species and individual susceptibilities, ranging from a 100 percent loss of a given trait to a complete lack of effect. Biochemical determinations also showed that plasmid-determined traits were affected to a greater degree than those determined by the microbial chromosome, and also that it was possible to select thermoresistant variants whose genotype remained unaffected. It remains to

be determined whether the electromagnetic field induced changes in the DNA structure or selected pre-existing stable, spontaneous mutants. Figures 4; references 26: 21 Russian, 5 Western.

UDC 541.128.7

Effects of Low Intensity Electromagnetic Emission on Concentration Autowave Processes in Belousov-Zhabotinsky Reaction

18400349a Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 304 No 5, Feb 88 (manuscript received 27 Jul 88) pp 1143-1147

[Article by A. S. Kovalenko, K. B. Yatsimirskiy, academician UkrSSR Acad. Sci., L. N. Lugina, Ye. A. Andreyev and L. P. Tikhonova, Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] An analysis was conducted of the impact of low-intensity electromagnetic emissions (EME; 40-60 GHz) on autowave processes in the concentrations of chemical species commonly seen in typical Belousov-Zhabotinsky reactions (BZR). The experimental design involved a shallow (1 mm) excitable system represented by 0.003 M ferroin, 0.3 M sodium bromate, 0.2 M malonic acid, and 0.45 M sulfuric acid. Studies conducted with a wavelength range of 1.6 to 5.6 mm and 6 to 8 mW EME applied to wave-generation points showed that the effect of EME was to reduce the wavelength of the propagating waves by 35-41 percent. The autowaves with a shorter wavelength were more susceptible to the effects of EME than the longer waves. The susceptibility of the system diminished as the time between mixing and irradiation increased. The effects of EME were attributed to its effects on the periodicity of the auto-waves since the rate of propagation was not affected. Additional experimental provided proof that temperature effects could not be implicated in the wave effects observed with EME. For a similar degree of reduction in the wavelength a temperature increase of 3 to 7°C would be required, whereas the actual increase in temperature due to EME was 0.4°C. Figures 4; references 15: 8 Russian, 7 Western.

UDC 615.846.015.46:612.017.1].07

Phase Dependence of Immunomodulating Effects in Decimeter Wave Irradiation of Central Organs of the Immune System

18400384b Moscow IMMUNOLOGIYA in Russian No 6, Nov-Dec 88 (manuscript received 11 Jun 87) pp 37-40

[Article by V. M. Yevstropov and I. N. Silich, Kirghiz Scientific Research Institute of Health Resort Sciences and Physiotherapy, Frunze]

[Abstract] An evaluation was made of the effects of decimeter waves on antibody response in 300-400 gm guinea pigs, with the results assessed in terms of splenic

IgG and IgM antibody forming cells and the IgE response on the basis of passive cutaneous anaphylaxis. The animals in the IgG and IgM study were immunized intraperitoneally with 10^9 SRBC, and those in the IgE study, subcutaneously with a sonicated staphylococcal antigen. The thymic area or the tibia (bone marrow) was irradiated either with 80 mW/cm^2 decimeter waves for 10 min/day for 5 days (IgG/IgG study) or a single 10 min exposure (IgE study). The results showed that for all Ig classes, irradiation of the thymus in the inductive phase

was immunosuppressive, while irradiation of thymus in the productive phase was without effect. The findings with bone marrow irradiation were different: irradiation during the inductive phase was without effect, while irradiation during the productive phase enhanced the formation of all three classes of antibodies. These observations indicate that decimeter waves may be used to control the antibody response through irradiation of the appropriate tissues of the immune system. References 3: 10 Russian, 20 Western.

UDC 612.884.064:615.357:577.175.852

Selective Analgesic of Angiotensin and Bombesin in Nociceptive and Cutaneous Stimulation

18400337e Moscow BYULLEHEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 10, Oct 88 (manuscript received 21 Jul 87) pp 448-450

[Article by O. S. Rayevskaya, O. V. Fedoseyeva and L. V. Kalyuzhnny, Scientific Research Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences]

[Abstract] In view of the differences in the perception of dental and cutaneous pain, the analgesic effects of angiotensin II and bombesin on electrical stimulation of dental pulp and skin nociceptors were evaluated. The studies were conducted in 2.5-3 kg chinchilla rabbits; the effects of electrical stimulation and peptide administration were monitored by changes in the evoked potentials recorded from the somatosensory cortex. Administration of angiotensin II (50 ng/kg) into the third ventricle reduced the amplitude of the evoked potentials in dental stimulation, but had no effect on the evoked responses elicited by stimulation of the skin. Interventricular administration of bombesin (20 ng/kg) had the reverse effect with these two stimuli in terms of the amplitude of the P_{20-40} wave. Administration of naloxone (0.15 mg/kg) intravenously 20-25 min after angiotensin II had no effect on the response obtained with the latter in electro-dental stimulation. These observations confirmed previous reports that different peptide systems are involved in the mediation of different types of nociception. The degree of selectivity demonstrated here also demonstrates the involvement of peptides other than the more conventional endogenous opioids. Figures 2; reference 9: 2 Russian, 7 Western.

UDC 612.821.6+615.78

Effects of Tuftsin and Analog TP-1 on Learning, Memory, and Exploratory Behavior of Rats

18400358a Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 38 No 6, Nov-Dec 88 (manuscript received 30 Apr 87) pp 1033-1040

[Article by T. P. Semenova, M. M. Kozlovskaya, A. V. Valdman and Ye. A. Gromova, Institute of Biological Physics, USSR Academy of Sciences, Pushchino; Scientific Research Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] The effects of tuftsin and its synthetic analog TP-1 on learning and memory were tested in 230-250 gm male Wistar rats on the basis of an analysis of the changes in exploratory behavior and conditioned food reflex. Tuftsin or TP-1 were administered intraperitoneally 15 min before the trial in a dose of 300 μ g/kg. Within 15 min of administration of either agent, both

vertical and horizontal exploratory activity increased 1.5- to 2-fold. The effects with TP-1 were also apparent 6 h after administration, whereas the level of activity of rats treated with tuftsin had returned to baseline levels. In addition, multiple daily injections of either agent facilitated the establishment of a conditioned food reflex, and long-term administration of these peptides assured superior retention of the habituated behavior even after three months. This was particularly true of the initial components of the behavioral pattern which are related to afferent synthesis and decision making. Finally, diminished food reinforcement had less of a negative effect on the experimental rats than on control rats in terms of frustration and deterioration of conditioned behavior. The latter findings suggest that tuftsin and TP-1 act by modulating cerebral serotonergic as well as catecholaminergic processes. Figures 4; references 19 (Russian).

UDC 612.821.6+615.787

Effects of ACTH Analog on Learning and Memory in Rats

18400358b Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 38 No 6, Nov-Dec 88 (manuscript received 13 Jul 87) pp 1041-1047

[Article by V. M. Getsova, N. V. Orlova, A. A. Folomkina and V. N. Nezavibatko, Institutes of Higher Nervous Activity and Neurophysiology and of Molecular Genetics, USSR Academy of Sciences, Moscow]

[Abstract] Outbred female rats were used in assessing the psychotropic effects of $ACTH_{4-7}$ -Pro-Gly-Pro utilizing conditioned reflexes in the passive avoidance, bilateral avoidance, and labyrinth tests. The effects of the ACTH analog on the development of the conditioned response were evaluated by intraperitoneal administration of 10 μ g of the analog 30 min before elaboration, while functional status of the monoaminergic systems were modified by intraperitoneal injection of the serotonin precursor 5-hydroxytryptamine (100 mg/kg) 1 or 4 h before the trial, respectively. Administration of $ACTH_{4-7}$ -Pro-Gly-Pro alone was without effect in the elaboration of the conditioned reflexes. However, in combination with either 5-hydroxytryptamine or disulfiram—either of which when given alone suppressed formation of the conditioned reflexes—the ACTH analog acted to correct the adverse effects of the other agent. Biochemical studies provided evidence that the efficacy of $ACTH_{4-7}$ -Pro-Gly-Pro in overcoming the effects of 5-hydroxytryptamine and of disulfiram was due to analog-mediated enhanced catabolism of serotonin in the midbrain and in the medulla oblongata and to increased synthesis of norepinephrine in the adrenal glands. Figures 2; references 16: 5 Russian, 11 Western.

UDC 547.466'835.3.057

**Synthesis and Testing for Antimalarial Activity of
Acridine Derivatives of Amino Acid Hydrazides**

18400382c Moscow BIOORGANICHESKAYA
KHIMIYA in Russian Vol 14 No 11, Nov 88
(manuscript received 27 May 88) pp 1565-1569

[Article by V. A. Shibnev, M. P. Finogenova, L. N. Grinberg* and A. M. Allakhverdiyev*, Institute of Molecular Biology, USSR Academy of Sciences, Moscow; *Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Martsinovskiy, USSR Ministry of Health, Moscow]

[Abstract] A series of acridine derivatives of amino acid hydrazides were synthesized for testing as potential antimalarials in view of their structural similarity to mepacrine. In vitro testing of 2-methoxy-6-chloroacridine-9-yl- and 2-ethoxy-6-nitroacridine-9-yl-hydrazides of glycine, alpha- and beta-alanine, epsilon-aminocaproic acid, and GABA on chloroquine-sensitive and -resistant Plasmodium falciparum yielded IC₅₀ values in the 2 x 10⁻⁷ to 6 x 10⁻⁶ M range. The effective concentrations were on par with therapeutic plasma concentrations of quinoline and acridine antimalarial agents. These observations indicated that such derivates may yield clinically useful antimalarials, with the beta-alanine and the GABA derivatives appearing especially promising. References 11: 7 Russian, 4 Western.

UDC 612.591.1 + 612.766.1].017.1

Effect of Heat Conditioning and Physical Training on Nonspecific Resistance of the Body18400344 Moscow VOYENNO-MEDITSINSKIY
ZHURNAL in Russian No 9, Sep 88 pp 54-56

[Article by V.I. Sobolevskiy, candidate of medical sciences]

[Abstract] The nonspecific resistance of the human body during physical training and heat conditioning was evaluated on 32 healthy individuals who were 21-36 years of age and who did not engage in sports. They were formed into two groups: the first exercised for 40 min three times a week on a rowing machine or an exercise bike; the second group spent two periods of 12 min each with a 10 min break in-between in a sauna at 90 plus over minus 5°C air temperature and a relative humidity of 15-20 percent, twice a week. During the breaks they showered in water with a temperature of 12-17°C. A number of measurements was taken prior to and after each exercise and at the end of the 6 weeks period when the experiment was completed. Physical exercise increased the heart beat, on average, around 150 beats per minute, it raised sublingual temperature by 0.6°C (skin temperature by 0.4°C). Water loss was about 0.7 percent of body weight. Heat exposure produced similar figures of 129.4 beats per minute, +1.2°C (sublingual), 0.9°C (skin), and 0.9 percent (weight loss). No other significant changes were observed during the training exercise, except for a decrease in dermal autoflora in the heat conditioning group. References: 7 (Russian).

UDC 595.1

Comparative Evaluation of the Effects of Immobilization Stress on the Dynamics of Resistance to Lipid Peroxidation in Internal Organs and Brain of Rats

18400395b Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 304 No 6, Feb 89 (manuscript received 10 Jun 88) pp 1500-1503

[Article by Yu. V. Arkhipenko, V. V. Didenko, T. G. Sazontova and F. Z. Meyerson, Scientific Research Institute of General Pathology and Pathologic Physiology, USSR Academy of Medical Sciences, Moscow]

[Abstract] A comparative analysis was conducted on the effects of immobilization for various periods of time (20 min to 12 h) on lipid peroxidation in the heart, liver, and brain of 180-200 g male Wistar rats. Temporal analysis showed an immediate increase in lipid peroxidation in the heart and liver, and depression of this process in the brain. Peak levels of malonic dialdehyde in the heart and liver were seen between 1 and 6 h of immobilization, falling thereafter to essentially baseline levels. In the brain the response consisted of a fall in malonic dialdehyde in the same timeframe, and a rise to baseline value after 6 h. In quantitative terms, the increase in the rate of

lipid peroxidation (V/V_0) in the heart and liver over the baseline rate was 3.5-fold, while the decrease in the brain was on the order of 2.3-fold. The data were interpreted to indicate that special mechanisms exist in the CNS to limit activation of lipid peroxidation and to actually inhibit the process in stressful situations. Such regulatory mechanisms in the CNS, triggered by stress, serve not merely to preserve cerebral function, but actually to enhance it. Figures 1; references 7: 6 Russian, 1 Western.

UDC

615.851.11.015.4:612.013.1+612.013.1.063:615.851.11
:681.31**Microcomputer System for Biofeedback**

18402057 Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 3, Mar 89 (manuscript received 3 May 88) pp 75-83

[Article by E. M. Sokhadze, M. B. Shtark, and Ye. I. Shulman; Institute of Automation and Electrometry, Siberian Department, USSR Academy of Sciences; Institute for Clinical and Experimental Medicine, Siberian Department, USSR Academy of Medical Sciences, Novosibirsk]

[Abstract] A hardware and software system based on a microcomputer system and oriented toward conducting biofeedback investigations and clinical training on cardiovascular indicators is described. It is used to study the plasticity of central and peripheral mechanisms for regulating the cardiovascular system (CVS) during biofeedback training under conditions of multiparameter monitoring. The selection of hemodynamic indicators, which are informative for evaluating effects of the central and autonomic nervous systems (CNS and ANS) on circulation, is particularly important in such research. One of these indicators, pulse wave propagation time (PWPT)—which depends on arterial pressure (AP), minute blood volume, and peripheral resistance—is an integrated cardiovascular parameter which reflects the activity of regulating systems. For conducting research in biofeedback training, a medical microcomputer system developed at the Institute of Automation and Electrometry jointly with the Special Design Bureau of Scientific Instruments of the Siberian Department of the USSR Academy of Sciences and the Institute of Clinical and Experimental Medicine was used. The system's configuration includes an Elektronika-60 microcomputer (32K RAM), alphanumeric displays, diskette storage, magnetic tape storage, two color graphic displays, a printer, a plotter, a CAMAC crate, an RPG-2 rheoplethysmograph, and a PPV-02 pressure sensor. For research in the field of psycho-physiology and clinical training with biofeedback, the system includes software for EKG, quadripolar rheogram, differential rheogram, photoplethysmogram, pneumogram, and AP analysis. Use of accessible non-invasive indicators of the ANS and the biofeedback method makes it possible to investigate the activity of regulating mechanisms at various levels of physiological activation. High correlation coefficients

between PWPT and the respiratory arrhythmia amplitude (RA) and between PWPT and the respiratory sinusoidal arrhythmia amplitude (RSA), as well as a significant increase in RA and RSA values at the end of biofeedback sessions, allow one to conclude that parasympathetic activation plays an important role in modifying PWPT during biofeedback. Computer analysis of the dynamics of monitored non-invasive indicators of the CVS allows one to detect the effects of ANS sections on observed cardio- and hemodynamic shifts during PWPT biofeedback training, particularly a decrease in B-adrenaline and tendency toward decrease in α -adrenaline activity and a substantial increase in parasympathetic activity. Simultaneously registering the dynamics of a large number of indirect indexes allows one to obtain a wide profile of psycho-physiological variables which reflect the activity of regulating systems. An increase in PWPT during biofeedback is accompanied by a decrease in systolic pressure (SAP) and average AP, which indicates the clinical importance of biofeedback training, especially for patients with early symptoms of hypertension. Use of the microcomputer system improved the filing procedures for biofeedback administration and expanded the capability for analyzing data. Figures 5; references 25: 7 Russian, 18 Western.

UDC 616-003.96:613.166

Immunological Indices of Adaptation to High Temperatures

18402067c Kiev VRACHEBNOYE DELO No 2, Feb 89
(manuscript received 2 Sep 87) pp 95-97

[Article by S. M. Shchablenko, Clinical Biochemical Laboratory, Krivoy Rog Scientific Research Institute of Work Hygiene and Occupational Diseases]

[Abstract] A brief literature survey was conducted on the problems of the effects of high temperatures, especially in work-related situations, on the status of the immune system. The data compiled to date are unequivocal in demonstrating that working under such conditions has an adverse impact on immunity, both humoral and cellular. In addition, after ten years of occupational exposure to high temperatures evidence of recovery of baseline values of immune indicators was detected in only 14.7% of the workers, while pronounced depression continued to be the predominant finding in 41.3-44% of the cohort. These observations indicate that the immune system adapts poorly to high temperatures, a factor that

should form an important consideration in job selection and in assessing hygienic conditions at a work site. References 9 (Russian).

UDC 612.827+612.886+612.74

Age Factors in Effects of Rotation on Lateral Vestibular Nuclei, Cerebellar Fastigial Nuclei and Skeletal Muscles in Rats

Minsk IZVESTIYA AKADEMIYA NAUK BELORUSSKOGO SSR: SERIYA BIOLOGICHESKIH NAUK in Russian No 1, 89 (manuscript received 10 Mar 87) pp 60-63

[Article by Ya. V. Burko and L. V. Poznyak, Institute of Physiology, Belorussian SSR Academy of Sciences]

[Abstract] Thiopental-anesthetized albino rats were used to assess the importance of age in the effects of rotational motion on the function of the lateral vestibular nuclei (LVN), cerebellar fastigial nuclei (CFN), and the femoral muscle. The electrophysiological studies were performed on two groups of male rats—30 days and 4-5 months old—subject to rotation on a centrifuge with a 1.35 m radius with an angular acceleration of 2.5 m/sec². To evaluate the effects of adaption the animals were subjected to rotation for 8 h/day for 5 days per week for one month. Evaluation of the evoked responses of the LVN and the CFN to electrical stimulation of the femoral muscle in control and adapted rats revealed that the baseline responsiveness was greater in the younger rats. Acceleration led to a statistically significant increase in the integrated evoked response of the CFN in control young and older rats by 26.4 and 34.3%, respectively, with corresponding changes in the LVN by 38.6 and 42.1%. In the adapted animals the increases in the evoked responses of the CFN and LVN in the younger rats were 9.46 and 20.0%, respectively, and in the older rats corresponded to 13.8 and 28.2%. Studies on the excitability of the femoral muscle in terms of action potential generation showed that the threshold stimulus vs. duration plots were hyperbolic. In addition, the plots obtained for the older rats were above those for the younger, and in both cases the plots obtained after test acceleration were displaced downward from the control plots. These observations demonstrated that rotation affected both the functional status of the LVN and the CFN, as well as muscle electrophysiology. Figures 1; references 17 (Russian).

Tasks and Problems in Centralized Sterilization Departments

18402064 Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 2, Feb 89 pp 13-14

[Article by A. G. Alzhanov, V. I. Larionov and L. Ye. Karkoshkina, Department of Disinfection, Kazakh SSR Ministry of Health; Ust-Kamenogorsk Municipal Disinfection Station]

[Text] Considerable attention has been accorded recently in the Kazakh SSR to the establishment of central sterilization departments (CSD) at major treatment facilities and polyclinics to ensure sterilization and disinfection of medical instruments. The importance of the CSD in the prevention of hepatitis B and in the improvement of medical care cannot be overestimated; the economic worth of the CSD is indisputable.

To date, 667 CSDs have been established, including 104 at treatment facilities with less than 100 beds. In some oblasts (Ural, Guryev, Alma-Ata) the percentage of medical facilities with a CSD approaches 90%. The CSDs have improved their material base and their medical technology, and a large number of the CSDs possess specialized Soviet and imported equipment. Training in a special program for personnel working in the CSDs is being pursued more vigorously. Health-and-epidemiological station and DZ [not further expanded] personnel monitor presterilization procedures and the entire sterilization process; their work includes bacteriologic monitoring. Because of this, in 1987 morbidity due to hepatitis B stabilized, and tests positive for occult blood (0.47) and the proportion of positive results for sterility (1.7) decreased.

Many of the republic's CSDs have gained positive experience that is being used to train medical personnel in sterilization and have become leading training centers in their oblasts. The Disinfection-Sterilization Department (DSD) at the No 1 Municipal Hospital in Ust-Kamenogorsk deserves special mention in this regard. In 1984 it included two CSDs (one at a 750-bed hospital and the other at a polyclinic capable of handling 1200 patient visits per shift), a chamber department (for three hospital sterilization chambers), and a central facility for the preparation of disinfectants. The department, which is headed by a doctor's assistant with fifteen years experience, has been allocated 31 junior and senior medical personnel positions from the staff of the hospital.

The DSD operates in two shifts and is responsible for all the subunits at the hospital. The DSD is fully responsible for providing the hospital with sterilized instruments, disinfectants, and chamber processing of articles. In 1987 the department sterilized 2,420,100 medical instruments, disinfected 19,747 sets of soft articles in chambers, and prepared 209,660 liters of disinfectants. As part of quality control the DSD personnel performed over 24,000 tests for occult blood and 96,800 tests for surfactants.

The DSD personnel are constantly improving the department's operations. The variety of articles being sterilized has been increased, and centralized delivery of sterile items and pick-up of used materials has been introduced, which has not only saved time, but has also freed mid-level personnel from about 9-10% of the additional work they had to do. Moreover, the DSD periodically surveys the use of disinfectants at the hospital. The following indicators point to the effectiveness of the DSD: over the last three years the incidence of hepatitis B at the hospital decreased by 37%, the incidence of purulent postoperative complications fell to 0.8%, and of abscesses, to 0.04% (versus 1.2 and 0.13%, respectively, in 1983). Samples yielding bacterial growth fell from 18.1% to 0.7%, and those positive for pathogenic staphylococci from 1.5% to 0.1%. The use of nonstandard disinfectants was reduced from 20.4% to 4.7%.

Sanitary and antiepidemic conditions have been enhanced in the hospital and the polyclinic as a result of the reduction in broken syringes and the proper sterilization of the medical instruments. The availability and service life of the instruments has increased, which has had a good economic impact. The hospital's deputy chief physician, V. P. Semenov, deserved a great deal of credit in organizing the operations of the department.

Unfortunately, this is not the case everywhere. In the North Kazakhstan and the Chimkent oblasts, for example, only 25-49% of the larger medical facilities have a CSD; in the Karaganda Oblast 41% of the facilities lack a CSD, and in the Chimkent Oblast, 38%. The situation is no better in the Kustanay and the Dzhezkazgan oblasts, or in Alma-Ata. Sixty-six CSDs in Kazakhstan do not meet sanitary standards, and some of them have been closed down. As before, violations are observed in presterilization and sterilization procedures. The availability of sterilizing and washing equipment in treatment-and-prevention facilities leaves something to be desired, a fact that is impeding the creation of new CSDs and is having a negative effect of the quality of work at existing CSDs. The health administrators in these oblasts are not taking the proper measures to correct the situation: plans for opening new CSDs are not being implemented, and the advances that have been achieved are poorly publicized.

A way out of the vicious circle appears to be the creation of a central sterilization laboratory that would supply all city treatment facilities and polyclinics with sterile syringes, needles, and other medical articles. Centers of this type have already been established elsewhere in the USSR. In view of threat posed by AIDS, we feel that a radical approach must be taken to solve the problem of supplying the CSDs with the proper sterilization equipment and related equipment. Of paramount importance is the staffing of the CSDs with highly skilled, experienced personnel who have undergone special training at the best CSDs in the city or oblast.

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New Medical School Contemplated

18402168A Moscow MEDITSINSKAYA GAZETA in Russian 11 Jun 89 p 2

[Report: "At the Presidium of the USSR Academy of Medical Sciences"]

[Text] The Presidium of the USSR Academy of Medical Sciences examined the question of creating a faculty for training scientific cadre at the 1st Moscow Medical Institute imeni I. M. Sechenov.

There is a serious situation regarding the education of scientific personnel at scientific research institutions and higher educational institutions. The number of doctoral dissertations is declining and there is an increased need for candidates of science. The presidium is experiencing great difficulties in finding graduate students in fundamental medical research.

In view of the fruitful ties between scientists at scientific research institutes of the USSR Academy of Medical Sciences and the 1st Moscow Medical Institute, to attract talented young people to science, to improve the standards of fundamental and applied scientific research and to more rapidly introduce research results in health education and health care, the USSR Academy of Medical Sciences deemed it advisable to create a faculty for training scientific cadre at this VUZ.

This faculty will accept, on a competitive basis, students from the country's medical schools, beginning with the fourth class. It is planned to create three departments: biomedical sciences; clinical medicine; hygiene, microbiology and epidemiology. In addition to basic medical training, students at the faculty will undergo special training in these departments and will study statistics, computer technology, biological modelling and foreign languages.

The number of students in specialities will be determined by the requirements for cadre at scientific research institutes of the USSR Academy of Medical Sciences and at VUZes. Together with the 1st Medical Institute, these institutions will set quotas for training young specialists. USSR Academy of Medical Sciences department secretaries are entrusted with designating responsibility and preparing a contract between the academy and the 1st Moscow Medical Institute. This contract will make provisions for compensating clients for expenses in training students and, jointly with the rector, provide for the creation of scientific-educational centers in the appropriate specialities.

R500 Million Earmarked for Medicine

18402168 MEDITSINSKAYA GAZETA in Russian 21 Jul 89 p 1

[Article: "Foreign Exchange for Medicine"]

[Text] At the USSR Congress of People's Deputies medical officials posed the question of the medicine

shortage, perhaps a most alarming, and even tragic one. Shortages are always bad, say the deputies, but in health care they are totally impermissible. The lack of medicines is a real threat to human life.

Members of the USSR Supreme Soviet shared the concern of those deputies who are also medical officials. Several committees presented the government well justified demands concerning the need to purchase scarce medicines abroad. As a result 500 million rubles were allocated to the present urgent needs of health care.

Our correspondent asked Yu. N. Belenkov, deputy chairman of the USSR Supreme Soviet Public Health Committee, to explain how and when this money will be spent.

"This year the money will be used to acquire the most needed medicines on the long list of scarce ones," said Yuriy Nikitich, "above all, pharmaceuticals for children suffering from sugar diabetes, bronchial asthma, cardiovascular and other serious diseases which can only be cured by medicines. In my view medicine shortages are especially intolerable when they involve pregnant women, invalids, veterans, and our future—children."

"What will be the value of governmental approval of a health care program if many vitally needed pharmaceuticals are not available and there are frequent disruptions in the supply of even the most elementary medicines. One can understand the justifiable indignation of people who think that the medicine shortage is discrediting this program."

"Happily, the USSR Council of Ministers reacted quickly to requests by deputies-medical specialists, understanding that medicine shortages are not simply a medical problem, but are becoming a political one."

"Of course, we deputies are alarmed and dissatisfied that the many years of neglecting the contemporary technological base of the domestic pharmacological industry has now made it necessary to take "fire" measures. It is good that they "above" understand this. One cannot live forever with shortages, lagging and neglect of health care."

"I would like to note one other detail in this regard. At present ministries and enterprises are responsible only for fulfilling their own intragency targets. Nobody is responsible for completely supplying the public with medicines. Chaos reigns in the planned production of medicines. We have suggested to the government that starting next year it develop, within the State Plan for the Economic and Social Development of the USSR, a supply and demand balance for medicines and medical items."

"The time has come to organize this so that it will not be necessary to quickly plug up foreign exchange outflows, and so that one can acquire any medicine in any pharmacy at any time."

Family Planning Service in Kirgiz SSR

18402168.C Moscow MEDITSINSKAYA GAZETA in Russian 16 Jun 89 p 2

[Article: "With Concern About the Family"]

[Text] The demographic situation in Central Asia is quite complicated. For a long time practically nobody in this region has been working on the important question of family planning. Health protection for mothers and children has been very neglected and an ordinary consultation with a sexual pathologist was an almost insurmountable problem.

All the more reason to be happy that finally there is a marriage and family consultation service in the capital of Kirgiziya. This is something fairly new for medical

workers in Frunze. However, they have fervently undertaken this work. In 3,500 square meters of a new building in the city center there are 25 offices, 2 lecture halls, other halls and laboratories. There are several independent departments: surgical, with two day wards, psychotherapeutic and diagnostic. There are 24 doctors on the staff. They work in four areas: Help to the childless, diagnosis and treatment of female and male sterility, the treatment of complications during pregnancy and the treatment of sexual disorders.

There are now about 7,000 families on the consultation list. The new institution has already gained the respect of people in Frunze. At it one can receive a free consultation on preventing an unwanted pregnancy. Various kinds of contraceptives are always available.

Pregnancies are also terminated in an appropriate manner—vacuum devices are used.

Transport and Receptor Functions of Biological Membranes

18400356b Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKHO SSR: SERIYA BIOLOGICHESKAYA
in Russian No 6, Nov-Dec 88 pp 87-89

[Article by Zh. K. Usanova, M. K. Murzakhmetova, and R. Zh. Azimuratova]

[Text] An all-union working conference was held at the Physiology Institute of the KaSSR Academy of Sciences, 19-22 April 1988. It was organized by Scientific Council for the Complex Problem of "Biological Membranes and the Use of the Principles of Their Functioning in Practice" of the USSR Academy of Sciences, the Physiology Institute of the KaSSR Academy of Sciences, the Kazakh division of the Nutrition Institute of the USSR Academy of Medical Sciences, and the Kazakh Physical Training Institute of the KaSSR Ministry of Higher and Secondary Specialized Education.

Twenty specialists from leading institutions in Moscow, Leningrad, Kiev, Kaunas, Dnepropetrovsk, and Alma-Ata took part in the conference. Staff members from Alma-Ata's scientific institutions were present at the conference. The conference's scientific program included 13 problem reports and two roundtable discussions—"Liposomes as a Means of Selective Regulation of the Immune System" and "Regulation of Transport Enzymes."

The conference participants examined timely topics reflecting the state of the art of the biochemistry and biophysics of the receptor and transport functions of biological membranes—membrane structures, channels, proteins, lipids, translocation of proteins and ions, reception mechanisms, receptor interactions between liposomes and membranes, and regulation of transport processes. New methods and approaches that are promising for the study of membrane processes were examined at the conference, as were certain improved methods of automating the study of the conductivity of channel and receptor functions of biologic membranes. Attempts to coordinate membrane processes on a organ level were discussed at the conference.

Great progress was made in the study of membrane channel function. Interesting information from research on channel processes in artificial membranes was presented; potential-sensitive and hemosensitive channels of biological membranes are being researched extensively. At present, there is a great deal of work being done that illuminates the structure and functions of channels.

The report of P. A. Doroshenko (Physiology Institute imeni A. A. Bogomolets of the UkrSSR Academy of Sciences in Kiev) dealt with the regulator effect of calmodulin antagonists on the function of a nerve cell calcium channel. It was shown that, depending on their concentration, calmodulin antagonists exert a stimulating or a blocking effect on the calcium current. A

calcium channel probably has two types of binding sites. By modulating the ion-binding capacity in the channel it is possible to change the magnitude of the current, and when there is a certain degree of binding, the penetrating cation becomes a blocker.

B. I. Balkov (Biochemistry Institute imeni A. V. Palladin, UkrSSR Academy of Sciences, Kiev) presented a model system in which the translocation of eukaryotic proteins occurs through artificial membranes of lecithin that do not contain special protein channels. Dynamic pores are formed in the phospholipid bilayer itself. After the translocation has been completed, the aqueous pore disappears.

A. A. Lev (Cytology Institute, USSR Academy of Sciences, Leningrad) showed the binding mechanism of discrete fluctuations of current through model membranes with a change in surface conductivity. The appearance of isolated channels is frequently noted when the magnitudes of the resistance of the model membranes are measured. This typical phenomenon of an isolated channel is seen as the fluctuation of the membrane structure's conductivity. The author believes that the discrete fluctuation of the surface conductivity is a general phenomenon that may occur when the ions move through the isolated channels to membrane sites with no protein.

T. K. Rostovtseva (Cytology Institute, USSR Academy of Sciences, Leningrad) produced interesting findings pertaining to the appearance of channels in a bilayer lipid membrane in lipid peroxidation. It was shown that two completely different types of channels with conductivities that differ by two orders of magnitude may be obtained in one and the same system.

Living organisms must now adapt not only to temperature changes, but also to a great number of xenobiotics that have appeared with the development of the chemical industry. In view of this, it is necessary to create test systems for identifying certain compounds from the change in membrane composition and functions. S. V. Kotelevtsev's (Moscow State University imeni M. V. Lomonosov, Moscow) report presented data on the study of the lipid composition and activity of cytochrome P-450 during enzyme induction by xenobiotics. It was shown that the appearance of a foreign compound is accompanied by lipid synthesis and that a change occurs in the phospholipid composition.

Also presented at the conference was a wide range of works devoted to reception mechanisms and to the study of the molecular mechanisms of information transfer in membranes. We now know that the mechanism for signal amplification in visual reception is effected, as in hormone reception, through a regulator GTP-binding protein. The report of G. R. Kalamkarov (Chemical Physics Institute, USSR Academy of Sciences, Moscow) was devoted to the mechanism by which a sensory signal is switched off. A protein with a molecular mass of 48 kD is one of the participants of the system for switching-off

a sensory signal via effective inhibition of phosphodiesterase. The author hypothesizes that the 48-kD protein is accumulated in the cell and that there exists a functional system that is evidently connected with the cytoskeleton and transports protein from the inner visual segment to the outer one. Plans are being formulated to use the 48-kD protein to diagnose eye diseases.

Research on receptor mechanisms is important both in a fundamental and in a practical respect—delivery of biologically active substances, gene material, and medicinal compounds to within the cell is through the cell membrane. V. P. Torchilin (All-Union Cardiologic Scientific Center, USSR Academy of Medical Sciences, Moscow) discussed the main principles of using receptor interactions to introduce significant amounts of foreign substances into the cytoplasm. Liposomes serve as the transporter; used as modifiers are the appropriate ligands for which receptors capable of either being internalized or capturing the proper liposomes inside the endosome have been found. After this, the mechanism associated with the egress of the substance into the cell is carried out in accordance with the principle of pH-dependent lysis of the liposomes.

The report presented by O. V. Yesyrev (Physiology Institute, KazSSR Academy of Sciences, Alma-Ata) was devoted to the participation of regulator GTP-binding protein in the transmission of an inhibitory signal from the muscarinic and serotonin receptors to Na- and K-ATPase. The Na- and K-ATPase activity of sarcolemma preparations from the heart and smooth muscles of the small intestine were inhibited by neuromediators that exert their effect through specific receptors and an inhibitory GTP-binding protein. The report included data on the role of this system as well as on the phosphoinositide cycle in muscle activation. The participation of the phosphoinositide cycle in the glycosides' effect on a muscle cell is hypothesized on the basis of the experimental data.

In his report, M. K. Gilmanov (Molecular Biology and Biochemistry Institute, KASSR Academy of Sciences, Alma-Ata) presented data about the structure and functions of plant cell spherosomes, which are a lipoprotein protein complex of glutamic acid dehydrogenase and phosphatidylinositol. In addition to a storage function, as it turns out, the function of the spherosomes consists of converting the active soluble form of glutamic acid dehydrogenase into an inactive form bound with the spherosome. The glutamic acid dehydrogenase is activated by breaking the bonds between the protein and the lipid with specific phospholipase or by phosphorylation of the protein by phosphokinase synthesized in response to the hormonal effect of cytokinin.

In his report, A. S. Ivanov (Kazakh Physical Training Institute, Alma-Ata) presented the results of research on the dependence of the activity of the Ca-ATPase membranes of human erythrocytes on the intensity and duration of muscular activity as well as on the conditions

in which it is performed. Brief, intensive physical exercise may markedly stimulate the activity of Ca-ATPase, whereas longer periods of exercise may reduce it, with the onset of the inhibitory effect of muscle exercise occurring considerably earlier when one is in the mountains than when one is in the lowlands.

O. D. Ksenzhek (Chemical Technology Institute, Dnepropetrovsk) reported on using the results of research on membrane systems of biological origin in hardware. Special attention was placed on Langmuir-Blodgett films, which are sequentially applied monolayers of a given amphiphilic substance that are formed on the liquid surface and transferred to the solid substrate. By using the technique for forming Langmuir-Blodgett films it is possible to create complex, oriented molecular ensembles, which provides a number of new possibilities for using such films in the most diverse fields of technology.

The report presented by V. A. Zhukarev (Physiology Institute imeni A. A. Bogomolets, UkrSSR Academy of Sciences, Kiev) was dedicated to a promising approach to using optical methods based on controlling the concentration of intracellular calcium in real-time by registering the fluorescence of specific dyes.

M. S. Sinyaya (Physiology Institute imeni I. P. Pavlov, Leningrad) reported that the phenomenon of acclimatization was used to research the plasticity of cortical neurons that regulate the autonomic functions of the body. The author proposed a simple model for studying the acclimatization process. In that system, variations in the synaptic apparatus, in the properties of neurons, in the interaction among various sections of the brain, and in the plastic properties that are dependent on the formation of ion channels may be explained from the standpoint of the mechanisms that have been demonstrated for biological membranes.

The regularly held conferences on transport ATPases (1976, 1983) in the city of Alma-Ata, the first regional school entitled "Biologic Membranes—Structure, Functions, and Their Regulation" for the republics of Central Asia and Kazakhstan (1987), and the present working conference all facilitate the development of scientific research on this problem in Kazakhstan.

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All-Union Immunogenetics Symposium

18402167 Moscow MEDITSINSKAYA GAZETA in Russian 16 Jun 89 p 3

[Article by S. Suchkov, head of the Immunochemistry and Immunobiotechnology Laboratory, Moscow NII for Eye Disease imeni Gelmgolts [Helmholtz]: "Practical Tasks of Immunogenetics"]

[Text] The First All-Union Symposium "Immunogenetic Aspects of Autoimmunological Diseases and Secondary

"Immunodeficiencies in Humans" was held in Novosibirsk. It was organized at the initiative of the All-Union Scientific Society for Immunology, the NII for Clinical Immunology, Siberian Department, USSR Academy of Medical Sciences and the Immunology Institute, USSR Ministry of Health. About 100 specialists from Moscow, Leningrad, Kiev, Minsk, Novosibirsk and other large regional science centers participated in the discussion of urgent problems in basic, applied and clinical immunogenetics.

As the reports showed, the following problems have a special place in the contemporary directions in immunogenetics: predisposition towards multifactorial illnesses, their epidemiology and medical geography; ecological and occupational aspects; early donozological diagnostics, the formation of risk groups and dispensary observation; pathogenesis, prognosis, clinical progress and the efficiency of therapy.

Population research has been intensively developed on the distribution of HLA antigens among various peoples and nationalities in the USSR. This is very important in revealing groups at risk to various diseases in specific regions and to properly organize dispensary observation.

An exceptionally important result of the symposium is the tendency to introduce the methods of molecular immunology and immunogenetics in clinical practice. In particular, this means the widespread use, in early diagnostics, of cloned fragments of individual genes, specific monoclonal antibodies and other molecular tests. This approach is making a substantial contribution to forming a unified approach to the pathogenesis of automimmunological diseases and will help promote the rapid development of the newest methods of diagnosis, prognosis and treatment.

'Medrex' Medical Equipment Cooperative
18400646 Moscow MOSCOW NEWS in English
No 26, 2-9 Jul 89 p 7

[Text] The "MEDREX" company was founded at the 2nd Moscow Medical Institute named after N. I. Pirogov in December 1987.

The main aim of launching "Medrex" was to establish an independent medical and biological instruments company capable to design completely new pieces of medical equipment.

Each new instrument from "Medrex" is supposed to be a real innovation based on modern electronics.

Highly experienced physicians and electronic engineers start their collaboration from the very beginning of every project with the aim to assure the high quality design and capability of the new developments.

I hope that such a cooperation between designers and end-users at the early stage proves to be instrumental to our goal and gives us the possibility to create good instruments of world standards suitable for mass production.

Here at "Medrex" we are not interested in creating just ideas and prototypes—we serve for the medical equipment industry.

This is exactly the reason why we are searching for a reliable partner to share our knowledge and expertise in medical instrumentation and to establish a joint-venture company for the benefit of the Soviet people's health care.

We consider that the establishment of such a company is the most efficient way to satisfy our hospitals' demand for modern medical equipment.

In 1988 "MEDREX" has developed the following items:

- electronic thermometer (non-inertial type)
- reaction time and fatigue tester
- ECG simulator
- “Ocean” personal computer
- respiratory frequency meter

We are working now the following projects:

- electronic phonendoscope
- ECG machine with the analysis programme
- biophysical signals correlator
- local area network through city network line

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